In the name of God

the compassionate, the merciful

12th Biennial Electrochemistry Seminar

May 3-4, 2017

In collaboration with:

Iranian Chemical Society

Welcome Message from General Secretariat:

Dear Valued Participants,

On behalf of the organizing and scientific committees, it is my great pleasure to welcome you to the 12th Biennial Electrochemistry Seminar of Iran which is held at the University of Isfahan.

The organizing committee of the seminar, and the members of electrochemical branch of Iranian Chemical Society have tried to provide a national forum to bring all the Iranian electrochemists together in order to discuss the progresses and achievements in the field, take a look on the future challenges, establish scientific collaborations, and develop the networking. Isfahan is a beautiful and fascinating city, with its nice river, Zayandeh Rood, and you will enjoy the pleasant weather of city besides of the scientific programs.

We seize the opportunity to thank all the participants, oral and poster presenters. The abstracts received by the office of the seminar were printed and sorted into four categories, and reviewed by the invited scientific committee. According to the outcome results, 16 papers were selected for oral presentation and the 204 remainder as poster.

We should note that the abstracts are filed with some minor revisions regarding the seminar style and formatting. Therefore, the content of each abstract is authors' responsibility, and the scientific committee of the seminar assume no responsibility for the statements and opinions advanced by contributors.

Best Wishes

Esmaeil Shams Soolari

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Invited Talk 1

Wastewater treatment, bioelectricity generation and salt removal in microbial desalination cell

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ABSTRACT

Energy consumption has increased with an enormous trend in the last decades. Fossil fuels are a common type of non-renewable energy source which include a huge portion of energy consumption. Despite of being nonrenewable, fossil fuels also negatively affect the human life by releasing carbon dioxide. These limitations turn energy crisis eyes into green natural energy sources which come from wind, sunlight, algae or waste. In recent years there has been development of new fuel cells that use bacteria to create renewable energy in the form of electricity, hydrogen, and methane. Microbial desalination cells (MDC) is the most promising green technology for wastewater treatment with a desalination compartment added between the anode and cathode chambers. In this study, actual wastewater as anolyte solution was transferred from anode to cathode chamber for further treatment. Bioelectricity generation, power density, COD removal rate, coulombic efficiency, energy harvest rate and conductivity change in MDC using the bio-cathode were studied. The designated MDC obtained a salt removal rate of 83% over a batch cycle and removed more than 95% of organic matters within three days of batch cycle. The MDC also produced the maximum power density of 67W/m^3. These achievements may allow us to improve the performance of MDC and introduce a more effective process for both salt removal and wastewater treatment.

Keywords: Microbial desalination cell; Wastewater treatment; Desalination; Bioelectricity; Power density

Invited Talk 2

Emerging electrochemical systems: Integration of energy conversion, storage and consumption devices

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ABSTRACT

Electrochemical cells and systems are critical enabling technologies for renewable energy; energy management, conservation, and storage. A large number of electrochemical energy technologies have been developed in the past. These systems continue to be optimized in terms of cost, life time, and performance, leading to their continued expansion into existing and emerging market sectors [1].

In conventional electrochemical system, production of electrical energy via an energy conversion cycle is carried out in one device and storage or consumption of produced electrical energy is carried out in a separate device. This successive energy conversion cycle results in loss of a large part of usable energy.

In emerging electrochemical systems, it is being trying to reduce energy lost by integrating of energy conversion and storage or consumption in a single device. In this regard photoelectrochemical systems have been successfully employed for direct conversion and storage of solar energy to chemical energy through integrating photoelectrochemical hydrogen production with solar rechargeable batteries [2-5].

Another strategy is integration of energy conversion system, which generated electrical energy, with consumer parts such as a sensor or a desalination system [6]. Employing this strategy, it is possible to design a double function device or reduce complexity of a detection device.

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Invited Talk 3

Graphene-based nanocomposites in preparation of electrochemical sensors

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Recent years have witnessed an increasing interest in graphene and graphene-based materials due to their extraordinary electrical properties, large specific surface area, fascinating mechanical properties, good chemical stability and remarkable electrochemical activity. The combination of these properties make graphene an attractive candidate for a wide range of applications including energy conversion and storage devices (batteries and supercapacitors), electronic devices (transistors and memory devices) and solar cells. On the other hand, graphene has a potential application in constructing different kind of sensors such as biosensors and electrochemical sensors due to its planar structure, large active surface area and numerous edge atoms as active sites for electron transfer. As a result, the objective of this presentation is to introduce some kinds of nanocomposite of graphene with 3D structures for design and fabrication of electrochemical sensors.

In this regard, a 3D porous graphene-carbon nanotube (G-CNT) network is successfully constructed on the surface of glassy carbon electrode (GCE) by electrochemical co-deposition from a concentrated graphene dispersion. The large accessible surface area provided by the interpenetrated graphene backbone in one hand and the enhanced electrical conductivity of the 3D network by incorporating CNTs on the other hand, dramatically improved the electrochemical performance of the GCE in determination of Methotrexate (MTX) as an important electroactive drug compound.

In the next part, a simple and versatile in-situ approach is developed for the fabrication of a nano-structured thin film rGONi$(OH)_2$ on the surface of a glassy carbon electrode (GCE) by coating it with a thin layer of GO and then the partially electro-reduction to RGO by applying constant potential, following by electro-deposition of Ni$(OH)_2$ nanoparticles, which is capable to forming a uniform and stable thin film on the surface of the electrode. The resulting electrochemical sensor is conveniently applied to determination of RIF with a nanomolar detection limit.

Keywords: Electrochemical sensors, Graphene nanosheets, 3D graphene networks, reduced Graphene oxide, Carbon nanotubes, Nickel hydroxide nanoparticles, Methotrexate, Rifampicine

Invited Talk 4

Electrocatalysts in electrochemistry

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ABSTRACT

Electron transfer reactions are divided in two categories as following as: chemical or homogeneous oxidation-reduction and electrochemical or heterogeneous oxidation–reduction. Some electrochemical reactions have slow electron transfer rate. The slowness electron transfer in the electrochemical reactions caused that these electron transfer reactions occurred in the potentials which are different from their thermodynamic potentials. Thus, an overpotential must be applied for acceleration of these electrochemical reactions. Therefore, electrocatalysts were used for decrease the requirement overpotentials for slow electrochemical reactions. An electrocatalyst is a catalyst that participates in electrochemical reaction and assists in transferring electrons between the electrode surface and reactants. Therefore, electrocatalysts are compounds that facilitated the electron transfer and overall electrochemical reactions for obtaining high currents. The electrocatalyst materials increase the rate of electrochemical reactions without being consumed in the processes [1]. Various compounds such as organic, inorganic, organometallic, conducting polymers, metallic, nonmetallic and their oxides nanostructures, zeolites, carbon nanostructures, some of biocompounds and polymeric or nonpolymeric various composites were used as electrocatalyst for electrocatalysis of some slow electron transfer processes. The electrocatalysis process can be occurred as homogeneous or heterogeneous based on the type of reactant and electrocatalyst, their physical states and the working conditions and etc. The reactant and electrocatalyst are same phase in homogeneous electrocatalysis, whereas, the electrocatalysts were immobilized on the surface on the suitable electrode substrates or inputted in the electrodes matrices using various methods and mediated the electron transfer between the reactant and electrode substrate. Electrocatalysts have widely used in the electroanalysis of some pharmaceutical, biological, industrial and environmental compounds, facilitating the rate of electron transfer processes at the surface of electrodes in various of fuel cells and improvement their efficiency, photocatalysis and photoelectrocatalysis, electrochemical synthesis, preparation of electrochemical sensors and biosensors and etc. [2-8].

Keywords: Electrocatalyst, Electrocatalysis, Electrochemical biosensor, Electroanalysis

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Oral-1

Decreasing the effect of kinetic polarization by using reduced graphene oxide as an electrocatalyst for cathode support in lithium thionyl chloride battery

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ABSTRACT

In this research the effect of adding rGO nano-sheets to the cathode support on electrochemical reduction of thionyl chloride in lithium thionyl chloride battery has been investigated. Graphene oxide (GO) was prepared through modified hummer method. Reduced Graphene Oxide was synthesized by an in-situ chemical reduction procedure via $NaBH_4$ aqueous solution under N_2 atmosphere at room temperature. After washing and drying, in order to improve the crystallinity of rGO, the product was annealed in the tube furnace under N_2/H_2 (95/5) atmosphere for 90 min. Effective reduction can dramatically improve the electrical conductivity in rGO nanostructures. Acetylene black (100% compressed) and PTFE dispersion (60 wt%) were applied for preparation of cathode support composite material. For the preparation of the cathode substrate, rGO nano-sheets were applied in two procedures: a) Mechanical mixing and subsequently evaluating the electrochemical performance of the battery and b) preparation of composite and then performing the electrochemical measurements. Obtained results showed that adding rGO nano-sheets in both procedures significantly enhances the battery electrochemical performance. This effect remarkably can be observed in second procedure due to synergistic effect of both enhancing the charge transfer process and surface area increasement.

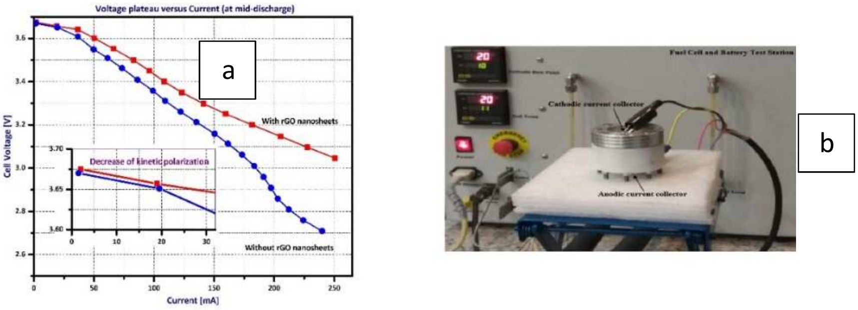

Figure 1 a) Effect of adding rGO [mechanical mixing] on polarization curve b) Battery test setup

Keywords: Lithium thionyl chloride battery, Reduced graphene oxide, Nanosheet, Kinetic polarization

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Oral-2

Dual amplified, sensitive electrochemical immunosensor for detection of HBsAg based on peroxidase-like activity of hemin/G-quadruplex and hemin-graphene-Au nanohybrid

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ABSTRACT

A simple and sensitive immunoassay protocol for electrochemical determination of Hepatit B surface antigen (HBsAg) was designed using hemin/G-quadruplex counjugated hemin-graphene – Au nanohybrid as distinguishable signal tags. The signal tags were prepared by synthesis of ternary graphene nanosheet- hemin-Au (H-GNs-Au) nanocomposite and then functionlized by hemin/G-quadruplex and methylene blue. These nanocomposite mimic natural enzymes with high catalytic activity toward H2O2 reduction in the presence of the methylene blue as mediator. Experimental results revealed that the designed electrochemical immunoassay enabled the monitoring of HBsAg with wide working ranges of 0. 1_1000 pg mL^{-1}. The detection limits (LODs) for this analyte at 0.01 pg mL^{-1}. The amplified and sensitive sensing platform showed great promising for the electrochemical determination of other protein target with satisfying results.

Keywords: (H-GNs-Au) nanocomposite, HBsAg, DNAzyme

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Oral-3

The synthesis of pyrimidine derivatives and investigation of their electrochemical behavior as novel additives and their specific effects on the performance of dye-sensitized solar cells

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ABSTRACT

As a new kind of additives, Pyrimidine derivatives were synthesized in oxidation and reduction forms. The influence of these electrolyte additives on the short-circuit photocurrent (J_{sc}) and open-circuit voltage (V_{oc}) of dye-sensitized solar cells was investigated by electrochemical and impedance techniques [1,2]. After addition of quinazolin derivatives to an electrolyte, cyclic voltammetry revealed a decrease in the rate of dye regeneration whereas electrochemical impedance spectra showed an increment in the charge transfer resistance due to the formation of a complex between the electrolyte additives and iodine, as characterized by an absorption peak around 370 nm in the UV–Vis spectra. It resulted in a decrease in J_{sc} of the dye-sensitized solar cells from 14.2 to 11.7 mA/cm^2. This adverse effect on J_{sc} can be attributed to the reaction or the coordination between the dye cations and the iodine in the electrolyte. In spite of the decrease in the short-circuit photocurrent, the open-circuit voltage and the conversation efficiency (η) increased significantly. The V_{oc} and η were enhanced for 20.4% and 16.1% respectively in comparison with the blank electrolyte.

Keywords: Pyrimidine compounds, Additives, Electrochemical impedance spectroscopy

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Oral-4

Modified overhead projector sheet as a flexible electrode for highly sensitive determination of sunset yellow

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ABSTRACT

Sunset yellow (SY) is a synthetically produced azo dye which has been broadly used into beverages and foods for its low production cost and high stability to pH, oxygen and light. Itis possible tocause allergies, anxiety, eczema, diarrhea and childhood hyperactivity particularly when it isexcessively consumed [1]. Therefore, it is of utmost important to detect SY with desired sensitivity and accuracy. Owing to the electroactive natures of SY and good properties of electrochemical methods, they were considered most attractive for its analysis. Hence, searching for novel electrodes with high specific surface area and conductivity is of considerable significance for the determination of SY [2].

In this study, a new and flexible strip sensor was demonstrated for SY detection. This strip is prepared by surface modification of nonconductive polyester sheet used as overhead projector film with a monolayer of 3-mercaptopropyltrimethoxysilane, silver film, graphene oxide and poly tartrazine, essentially to bring in the conductivity and catalytic activity towards SY detection [3].Large specific surface area and high conductivity of the proposed electrode made it an excellent sensing platform for sensitive determination of SY.The experimental parameters such as supporting electrolyte and its pH, the number of cycles for the electropolymerization and the scan rate for the sensor preparation were optimized. Under the optimum operating conditions, the peak currents for SY were found to vary linearly with its concentrations in the wide range of 0.001–0.05 and 0.05–10 μM. The estimated detection limit and sensitivity of the proposed electrode were 0.5nM and 2.53μA μM^{-1}, respectively. This sensor could be successfully applied for determination of SY in food samples.

Keywords:Strip sensor, 3-Mercaptopropyltrimethoxysilane, Graphene oxide, Poly tartrazine, Sunset yellow

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Oral-5

A green electrochemical synthesis of benzofuran derivatives

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ABSTRACT

The use of electric current as a reagent in organic synthesis display a “green technology” since it does not generate reagent waste. When the electricity originates from renewable resources, these synthetic applications are highly sustainable [1−2]. On the other hand, benzofuran is an important class of heterocyclic compounds which is widely found in bioactive natural and synthetic substance, and the development of green and efficient methods to construct of these heterocycles is one of the major topics in organic synthesis [3-4]. Following of our experience on the electrochemical construction of heterocycles [5], we were particularly interested in the synthesis of new benzofuran derivatives via electrochemical oxidation of 4,4`-biphenol in the precence of C-H acid compounds as nucleophile using both controlled-potential and constant current techniques. Our voltammetric data indicate that the anodic oxidation of 4,4`-biphenol produce 4,4`-diphenoquinone. Then this moiety acts as Michael acceptor in the presence of CH-acid (1a-c) and after cyclization providing desired product in high yield and purity. On the basis of our results, depending on the applied potential, two different series of benzofuran derivatives are isolated. In this methodology, a mixture of water and ethanol was used as the solvent, and the use of toxic and/or hazardous reagents was avoided.

Keywords: Electrochemical oxidation, Benzofuran , 4,4`-Biphenol, 4,4` -Diphenoquinone, Michael acceptor.

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Oral-6

Layered $Co(OH)_2$ deposited polymeric carbon nitrides modified electrode for high-performance oxygen evolution

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ABSTRACT

Oxygen evolution reaction (OER) got tremendous attention due to its challenging sluggish reaction kinetics induced by the multistep proton coupled electron transfer.

Carbon nitrides (C_3N_4) are a class of polymeric materials consisting mainly of carbon and nitrogen has excellent stable electrochemical properties, low cost and morphology tailoring[1]. However, due to low surface area and inherent low electrical conductivity, C_3N_4 is mainly restricted to OER. One of the possible ways to use them is to increase or create more active sites for OER. It is well known that Co^{2+} and Co^{3+} are the active sites for OER[2]. By combing C_3N_4 and Co-based materials into hybrid, structure to get the advantages of their respective active sites is an ideal way to lower the energy barrier for oxygen evolution. Furthermore, it may also result in new active site of Co-N, which will improve the OER activity with higher efficiency [2].

Herein, a distinctive catalyst is developed for OER based on layered $Co(OH)_2$ deposited carbon nitrides. The OER performances of prepared materials were tested using linear sweep voltammetry (LSV). Remarkably, the layered $Co(OH)_2$ / carbon nitrides can afford a current density of 10 $mAcm^{-2}$ at a small over potential of 379 mV which is smaller than those commercial IrO_2/C (462 mV), and metal-free PNC(porous N-carbon) (maximum achieved current density of 7.5 $mAcm^{-2}$ at 576 mV). Although the individual materials show very low activity, layered $Co(OH)_2$ / carbon nitrides exhibits low over potential. The result shows critical role of cobalt hydroxide and nitrogen species in the OER activity of these materials. Moreover, a fast electron transport in OER at $Co(OH)_2$ /carbon nitrides is confirmed by the smallest semicircular diameter ($R_{ct}=80\Omega$) of electrochemical impedance spectroscopy (EIS) . Modified electrode shows excellent stability and high efficiency for OER.

Keywords: Carbon nitrides, Layered $Co(OH)_2$, Oxygen evolution.

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Oral-7

Electrochemical behavior of salicylic acid and acetyl salicylic acid (Aspirin)

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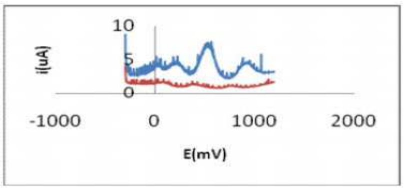
ABSTRACT

Acetylsalicylic acid (ASA) or aspirin, the world's oldest and best known nonsteroidal antiinflammatory drug, continues to receive special attention due to its clinical effects on inflammation, fever, renal function, and platelet aggregation. Aspirin is rapidly hydrolyzed in the body to salicylic acid (SA), which is responsible for most of the pharmacological activities of the parent drug. Further oxidation and conjugation of SA in the body leads to its metabolites including 2,3-dihydroxybenzoic acid (2,3-DHBA), 2,5-dihydroxybenzoic acid (2,5-DHBA), 2,3,5-trihy-droxybenzoic acid (2,3,5-THBA), glucuronide products and uric acid derivatives. Recent studies showed that daily low doses of aspirin could also effectively prevent cancers and attenuate the effects of neurodegenerative disorders[1,2,3]. We investigated SA and ASA electrochemical oxidation reaction on glassy carbon electrod(GCE) using differential pulse voltammetry(DPV). The representative DPV curves for 0.2mmol/lit pH 7.44 phosphate buffer salin (PBS) at GCE are shown in Fig. 1.



Fig(1): Differential pulse voltammetry (DPV) curves of 0.2 mM salicylic acid (red curve) and 0.2mM acetylsalicylic acid(blue curve) in 0.1M pH PBS(suppoting electrolyte) at scan rate 36.5mV/s.

The anodic oxidation peaks of 0.2 mM SA(red curve) and 0.2mM ASA (blue curve) at glassy carbon electrode in 0.1mol/lit pH 7.44 PBS was found to be at 0.764 V, 0.914 V, respectively. That somewhat similar the peak of anodic oxidation in cyclic voltammetry acetylsalicylic acid and salicylic acid anodic oxidation peaks at lower potentials due to the various products of oxidation species[3].

Keywords: Acetylsalicylic acid, Salicylic acid, Differential pulse voltammetry.

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Oral-8

Metal-organic framework thin films: from microporous to mesoporous

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ABSTRACT

Metal-organic frameworks (MOFs) are spotlight of a comprehensive research area, particularly in material science and chemical industry.[1] These materials, consisting of integrated organic-inorganic supramolecular agents including hierarchically crystalline networks of electron donor linkers and electron acceptor metal cations.[2,3] A literature survey shows that significant quota of the published papers have been focused on the microporous MOF thin films.[4,5] In this work, we introduce a novel and general strategy for an environmental friendly fabrication of mesoporous MOF thin films via electrochemically assisted self-assembly technique. Implementation of this procedure as a one-step, additive-free and versatile protocol lead to in-situ simultaneous synthesis and deposition of mesoporous architectures of MOFs at room temperature under green conditions, without need to any base, pretreatment or chemical modification of underlying surface. Our procedure, provides a controllable method for the synthesis of mesoporous MOF thin films (modified electrodes) consisted of hollow 3D-hexagonally packed crystals with 2D-honeycomb-like mesopores in the wall of cavity, which grow perpendicularly on to any of conducting surface. The resulting modified electrode showed enhanced electron transfer properties and better mass transfer performance along with the appropriate signal, suitable for electrochemical sensing applications. This work can be a breakthrough and new perspective for the modification and functionalization of the surface with any type of mesoporous MOFs by the electrochemical driven co-operative (soft templating) mechanism.

Keywords: MOF, Mesoporous, Thin film, Electrochemical synthesis, *EASA*

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Oral-9

Zeptomolar detection of mercury based on electrochemical aptasensor

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ABSTRACT

Atomic-level detection of mercury based on DNA hybridization-dehybridization of double-strand DNA (dsDNA) modified gold electrode is presented. A single strand DNA (ssDNA) treated by thiol-substitute is self-assembled on a gold electrode surface supplemented by S-Au bond. The hybridization of ssDNA and complementary DNA (cDNA) followed by dehybridization in the presence of mercury ions is recorded by differential pulse voltammetry (DPV) technique using $Fe(CN)_6^{3-}$ as redox probe. The sensor is highly selective to Hg^{+2}, without interference from other metals ions. Current sensitive electrochemical aptasensor is able to specifically detect a countable number of Hg^{+2} ions at range of 5 zeptomolar to 55 picomolar with limit of detection of 6×10^{-22} M close to the dream of single atomic detection without utilizing any complicated procedure and materials. Compared with previous reports, the proposed method manifested .Great advantages including high sensitivity, rapid response, stability, low cost and ease of operation.

Keywords: Aptasensor, Differential pulse voltammetry (DPV), Self-assembled

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Oral-10

Synthesis of nanostructure spinel ferrite nickel and its carbon composite for supercapacitors

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ABSTRACT

In recent years, supercapacitors have attracted interest for applications requiring high-power energy sources, such as electronic devices due to their fast charge and discharge rate, high power density (1–2 orders of magnitude higher than batteries), long cycle lifetime and high reliability [1]. Recently binary metal oxides such as spinels are emerging as new electrode materials owning to their rich redox reactions [2]. In this study, a facile route has been applied to synthesize nanocomposite based on nickel ferrite ($NiFe_2O_4$) and carbon nanofiber (CNF) as a high-performance supercapacitor electrode material. The $NiFe_2O_4$ nanostructures were prepared by the co-precipitation method. In a typical synthesis, 0.2 M solution of iron nitrate and 0.1 M solution of nickel nitrate were prepared and vigorously mixed under stirring for 1 h at 80 °C. Subsequently, 5 ml of hydrazine hydrate was added drop by drop into the solutions and brown color precipitates were formed. Finally, the precipitates were separated by centrifugation and dried in hot air oven for 4 h at 100 °C. In order to obtain the $NiFe_2O_4$ nanoparticles, the as-synthesized was annealed at 300 °C for 10 h. SEM image confirms the preparation of $NiFe_2O_4$ nanostructure. The working electrodes were prepared by mixing electrode material (i.e pure $NiFe_2O_4$ and its composite containing 40% CNF), acetylene black, graphite and polytetrafluoroethylene (PTFE) with a ratio of 70:15:10:5. A small amount of ethanol was added to make a homogeneous mixture. The resulting suspension was coated onto stainless steel grid substrate and then pressed at 15 Mpa for 10 min. All electrochemical measurements of electrode materials were carried out using cyclic voltammetry at different scan rates (10–100 mV/s) and galvanostatic charge–discharge at different current densities (1–20 A/g) in 0.5 M H_2SO_4 electrolyte. The results of the study revealed that nanocomposite electrode material has a high specific capacitance (249 F/g) in comparison to its constituents viz $NiFe_2O_4$ (130 F/g) and CNF (98 F/g) at the current density of 1 A/g. Additionally, with a 20-fold increase in current density from 1 to 20 A/g, 44% of the initial capacitance was retained in the $NiFe_2O_4$-CNF electrode, indicating its high rate capability which is significant in practical supercapacitor applications.

Keywords: Supercapacitor, Nanostructure, $NiFe_2O_4$, Spinel

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Oral-11

Development of a DNA biosensor based on conformational switching in G-quadruplex structure for anticancer drug detection

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ABSTRACT

The unique ability of living systems to translate biochemical reactions into mechanical work has inspired the design of synthetic DNA motors which generate nanoscale motion via controllable conformational change. It is believable that G-quadruplex structures in certain regions of the genome may play a role in the poor maintenance of genomic stability, which is a characteristic of many types of cancers [1-2]. In this regards, formation and stabilization of the quadruplex structures at the telomeric repeats is an effective way to hamper the telomere extension and blocking the elongation step [3]. Here, we report a DNA biosensor for selective Gquadruplex-binding ligand recognition, based on a conformational change; the forces exerted by the precise DNA machine for Gquadruplex conformational change were probed via an electrical signal transducer electrochemically by differential pulse voltammetry and cyclic voltammetry. The proposed machine was prepared by modifying the screen-printed graphite electrode (SPE) with the synthesized SBA-N-propylpipyrazine-N-(2-mercaptopropane-1-one) (SBA@NPPNSH) mesoporous structures and Au nanoparticles (AuNPs). The thiolated functionalized groups of SBA@NPPNSH structures can help for preconcentration of the synthesize AuNPs on the surface. Then SH-G_4DNA was linked to the modified electrode by an AuNPs-S bond. This platform was used to study the interaction between G_4DNA and some different drugs such as Tamoxifen (TAM), Flutamide (Flu) and also family medicine with Cephalexine (CEF) drug like Cephexime (CIF) and Amoxicilin (Amo), to measure its ability for stabilizing this structure. The result showed that anticancer drugs of Flutamide and Tamoxifen have the best answer.

Keywords: G-quadruplex DNA; Telomere; Electrochemical biosensor; Modified SBA-15

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Oral-12

Investigation of electrochemical behavior of folic acid on the gold surface for cancer cell capturing

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ABSTRACT

Folic acid was assembled on the gold-mercaptopropionic acid surface and the assembled system, Au-MPA-FOA, was successfully tested for capturing of the mouse breast cancer cells 4T1. Electrochemical characteristics of folic acid on the surface were studied by cyclic and differential pulse voltammetry in the presence and the absence [1] of redox probe. Electrochemical impedance spectroscopy (EIS) and attenuated total reflectance Fourier-transform infrared spectroscopy were also used for surface characterization study. To evaluate the capturing ability of the folate receptor (FR) expressed cancer cells by the prepared system, the 4T1 cells were tested as a model of FR-expressed cells [2], and the human foreskin fibroblast cells as a model of *no* FR-expressed cells [3]. The presence of cancer cells on the system surface was successfully detected by EIS based on variations of the charge transfer resistance (R_{ct}) of the $[Fe(CN)_6]^{3-/4-}$ redox probe at the Au-MPA-FOA electrode system/solution interface. Large variations observed in the R_{ct} of the electrode supported high affinity of the Au-MPA-FOA system for 4T1 cells.

Keywords: Gold, Folic acid, Cancer cells

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Oral-13

Investigation of oscillatory and chaotic behavior of Cu/H_3PO_4 reaction

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ABSTRACT

Chemical oscillation reaction can occur under certain experimental condition. These types of reactions which are far from equilibrium are well observed in biochemical systems. In chemistry some reactions need to examine far from equilibrium. In this type of reaction system cycle around some steady states and show a nonlinear behavior. (Like BZ reaction, mercury beating heart etc.) One of most common type of chemical oscillation reaction is oscillatory electrodissolution of metals in acidic solution. The classical example of an oscillatory electrochemical reaction is the anodic dissolution of metals in aqueous solution. Observations of current or potential oscillations during the chemically or electrically induced corrosion of various metals is well-known phenomenon. The electrodissolution of copper in various electrolytes has been an active area of research in nonlinear chemical dynamics. In our experiments we used three electrode method. a copper wire as working electrode, carbon electrode as antiworking and standard Ag/AgCl as reference electrode. all the solutions made of H_3PO_4 85% and diluted. in cyclic voltammetry at a certain potential (change with concentration and temperature) system shows an oscillatory behavior that depend on concentration and condition of system may be harmonic, MMO, chaotic etc. by using CV at certain potential chornoamperometry and impedance has been done and showed some new results.[1][2] Figure 1 shows cyclic voltammetry behaviour of Cu electrode in 2M H_3PO_4 with Scan rate 10in potential 1.27 V an oscillation starts with chaotic behavior. this behavior changes by setup any tiny change even just in concentration in solutions. Figure 2 shows phase space trajectories of electrode in figure.1.by help of this technique obtain a bistable attractor in phase space.this chart and impedance spectroscopy lead to bifurcation diagram. In the peresent work the behavior of oscillatory reaction and chaotic behavior would discused.

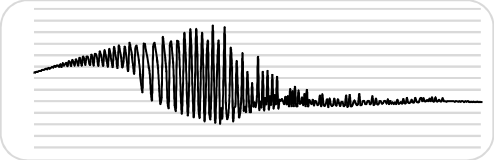

Figure 1

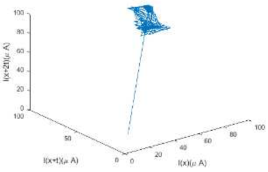

Figure 2

Keywords: BZ reaction, Oscillatory reaction, Chaotic behavior in chemistry

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Oral-14

Synthesis of Au nanostructure by bipolar electrochemistry method on gold electrode for immobilization of glucose dehydrogenase toward oxidation of glucose

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ABSTRACT

Bipolar electrochemistry (BPE) has been lately explored as a simple and reliable electrochemical technique for the modification of various conductive substrates. The BPE has particular advantages features compared to conventional electrochemistry especially in a simple setup, which involve a direct current (DC) power supply, low cost, ease of setup, no direct electrical connection required and many electrodes can be controlled simultaneously with a single DC power supply. Herein, this is applied to derive the gold nanostructures on the surface of bipolar gold electrode. The modified electrode is utilized as a suitable substrate for immobilization of glucose dehydrogenase enzyme aimed at direct electrocatalytic oxidation of glucose as sustainable biofuel in the biofuel cell compartments. The structure and surface morphology of modified electrode were determined by spectroscopic methods such as scanning electron microscopy, atomic force microscopy and electrochemical impedance spectroscopy. Electrocatalytic activity of modified electrode toward oxidation of glucose was investigated by cyclic voltammetry technique. The onset potential and the magnitude of current density for glucose oxidation on the modified electrode were obtained to be -0.03 V (vs. Ag/AgCl) and 2.7 mA cm^{-2}, respectively. This newly developed modified electrode has the potential to be used as bioanode in biofuel cells. Finally, the results of this study clearly indicate the effectiveness of the proposed method for modifying the metals surfaces with high potential ability designed for extensive catalytic performances, particularly adsorption of biomolecules for electrocatalytic applications.

Keywords: Enzyme immobilization, Modify electrode, Bipolar electrochemistry, Au nanostructures.

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Oral-15

An ultrasensitive sandwich-type electrochemical immunosensor for the determination of VEGF165 tumor marker based on carbon dot modified electrode

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ABSTRACT

Lung cancer is the second most common cancer after breast cancer, and it is by far the leading cause of cancer death for humans [1]. One of the most effective ways to detect lung cancer is determination of vascular endothelial growth factor (VEGF165) level in human serum samples. Therefore, it is necessary to develop a sensitive, selective and cost-effective method for determination of VEGF165. Electrochemical immunosensors, which combine specific immunoreactions with electrochemical transduction, have attracted growing attention in recent years [2]. Carbon dots (C-Dots) were employed for enhancing the sensitivity of electrochemical detection, since they show unique electrochemical properties, such as strong ability for electron transfer, high catalysis activity, and large contact area due to the decreasing particle size [3]. We report an electrochemical aptamer-based biosensing assay for VEGF165 protein detection by using methylene blue (MB) as electrochemical indicator and modifying the electrode surface using C-Dots. Differential pulse voltammetry (DPV) were employed to detect the change of MB oxidization peak current related with the VEGF165 concentration. DPV detection showed a reliable and more sensitive quantification of VEGF165 with a detection range of 0.01 pM–10 nM and a lower detection limit 3.3 fM.

Keywords: Electrochemical immunoassay, Carbon dot, Aptamer, methylene blue, Lung Cancer

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Oral-16

Pyridinium-facilitated CO_2 electroreduction on Pt nanowire: enhanced selectivity toward methanol and formic acid

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ABSTRACT

Higher selectivity toward CO_2 reduction was observed when Pt nanowire (Pt NW)[1] assembly utilized as a co–catalyst in a process activated by pyridinium ($PyrH^+$)[2]. It is found that the overall faraday efficiency for CO_2-derived products is 55%. The methanol and formic acid were merely detected compounds in aqueous solution by high performance liquid chromatography. We believe that higher tendency of Pt NW to accumulate hydride on its surface is responsible for obtained higher electrochemical performance in CO_2 conversion.

Keywords: CO_2 electroreduction, Pt nanowire, Enhanced selectivity, Methanol, Formic acid.

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PS101

Doping of hematite semiconductor with sulfur for enhanced electrical and photoelectrochemical activity

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ABSTRACT

Photoelectrochemical (PEC) solar energy conversion has been well studied since its first introduction by Fujishima and Honda [1]. Since then, manipulating and adapting various semiconductors to simultaneously capture, convert, and store solar energy became the main research topic in photoelectrochemistry. Hematite (α-Fe_2O_3) potentially can satisfy most of the initial conditions to be employed as the photoanode for artificial photosynthesis [2]. Herein, we report preparation of S-doped α-Fe_2O_3 with enhanced photoelectrochemical performance, through annealing the hematite photoanodes in a furnace containing small amounts of sulfur powder. Characterization results (from XRD, SEM, EDX, UV-Vis, FTIR, and XPS) showed successful incorporation of sulfur species into the hematite lattice. Considering obtained results, cationic substitution of sulfur (S^{4+}) in hematite lattice was more probable than its anionic substitution (S^{2-}). In addition, partial reduction of Fe^{3+} species to Fe^{2+} followed by increase in oxygen vacancy sites, led to higher charge carrier mobility through polaron hopping mechanism. Higher mobility reduces recombination rate of photo-generated charge carriers in hematite, and as a result, photocurrent produced by the hematite photoanode showed 4 times increase after simple sulfur doping process. The synthesized S-doped hematite is highly stable and shows no performance decline under continuous illumination. Moreover, electrochemical impedance studies indicated that charge transfer at the surface of the photoanode has facilitated after sulfur doping.

Keywords: Hematite, Sulfur doping, Photoelectrochemical water splitting

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PS102

Light-powered cell for naked eye detection of glucose

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ABSTRACT

The concept of self-powered detection devices or sensors has been directed towards scavenging energy from the environment. In fact, a self-powered detection device does not need external electrical power source [1]. In this line, harvesting visible light to serve as an external power source seems a promising approach which could be achieved in a photoelectrochemical (PEC) or photochemical device [2]. On the other hand, use of the eyes as a detector is one of the strategies to simplify detection system [3,4]. In this work, a novel concept for light-powered photoelectrochemical detection with naked eye is introduced. The concept is based on coupling of a photoelectrode with an electrochromic counter electrode. Photocurrent generated due to photoelectrochemical reaction of analyte at the photoelectrode leads to change in oxidation state and consequently in the color of electrochromic material deposited at the surface of counter electrode, so eye detection of analyte is possible. There is no need to any external power source except light as whole of the required electrical charge for color change of electrochromic material comes from photocurrent generated via photoelectrochemical reaction of analyte. This concept is examined in detection of glucose. In supposed design, a hematite photoanode modified with nickel hydroxide ($Ni(OH)_2$) is coupled with an electrochromic cathode, prussian blue, electrodeposited on a fluorine-doped tin oxide. Under illumination, photo-oxidation of glucose at the photoanode leads to reduction of prussian blue to prussian white in the cathode, so glucose could be detected easily by naked eye with the aid of decolorization of prussian blue as the electrochromic indicator.

Keywords: Photoelectrochemcial detection, Prussian blue, Hematite, Nickel hydroxide, Glucose

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PS103

Study of the effect of pomegranate peel extracts on the electrochemical oxidation of acetaminophen

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ABSTRACT

Acetaminophen is known as one of the safe medicine, but it can be dangerous (liver damage and even death) if be taken in large quantities [1]. In all cases, acetaminophen poisoning is treated with N-acetylcysteine [2, 3]. In this work, electrochemical oxidation of acetaminophen has been studied in the presence of pomegranate peel juice in aqueous solutions. Cyclic voltammetry and controlled-potential coulometry have been applied as diagnostic techniques. Obtained results indicate that the N-acetyl-p-benzoquinone-imine (NAPQI) derived from acetaminophen participate in catalytic reaction with both pomegranate peel and juice via EC' mechanism. The catalytic current depends on the concentration of pomegranate peel and juice and solution’s pH. Furthermore, based on an EC' mechanism, the homogeneous rate constant of the chemical reaction between generated NAPQI with pomegranate peel juice was estimated by comparing the experimental cyclic voltammetric responses with the digital simulated results. Comparison of observed homogeneous rate constants (k_{obs}) shows that NAPQI reacts with pomegranate peel juice about ten times more rapidly than does N-acetylcysteine. Finally, these results are undeniable electrochemical evidence which shows pomegranate peel can be used as a suitable antidote in overdoses of acetaminophen instead of N-acetylcysteine.

Keywords*:* Pomegranate peel extract, Acetaminophen, Electrochemical oxidation, Cyclic voltammetry

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PS104

Preparation and electrochemical properties investigation of sheet like electrode

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ABSTRACT

One of the greatest challenges of modern society is to stabilize a consistent energy supply that will meet our growing energy demands [1]. Hence, in the visible future, it seems only lithium batteries may have reasonable energy density and cycle life [2]. Desighing new structure in electrode materials is so important in battery performance. Recently MXene a new calss of two dimensional structure such as graphene, boron nitride [3] are prepared by the exfoliation of ternary carbides, nitrides, or carbonitrides, so-called MAX phases with a formula of $M_{n+1}AX_n$, where M is an early transition metal, A is an III or IV A-group element, and X is carbon and/or nitrogen [4]. These graphene like mateials can be promising candidate for use as electrode. We prepared Ti_3C_2 MXene by selective etching Si element from Ti_3SiC_2 MAX phase. The early MAX phase was synthesis by spark plasma sintering method from Ti, SiC, C and Al elements. X-ray diffraction and scaning electron microscopy was performed for characterixation of MAX phase and its related MXene.we fabricate electrode by using this MXene, carbon black and PVDF/NMP mixture. Li foil was used as refrence electrode for battery cell. This battery exihibite good performance rather than common electrode materials which use in new generation of batteries.

Keywords: Battery, MAX phase, MXene, Electrode

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PS105

One pot synthesis of core-shell made from manganese oxide nanoparticles and polyacrylic acid polymer: physicochemical characterization by surface analysis and electrochemical methods

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ABSTRACT

In this work, one-pot solvothermal synthesis of core-shell structure made from the manganese oxide and polyacrylic acid is reported. The constructed nanoparticles are characterized by surface analysis methods including field emission scanning electron microscopy, Fourier transform infrared spectroscopy and X-ray diffraction and electrochemical methods such as cyclic and differential pulse voltammetry and electrochemical impedance spectroscopy. The obtained results indicate successful synthesis of the nanostructure via solvothermal method by controlling time and temperature of the reaction process. The prepared nanostructure has the capability of modification by various species for application in science and nanotechnology due to possessing carboxylic acid functional groups.

Keywords: Manganese oxide, Polyacrylic acid polymer**,** Core-shell nanoparticles, Electrochemical methods

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PS106

Mechanistic study of electrochemical oxidation of acetaminophen in the presence of thiol-containing drugs

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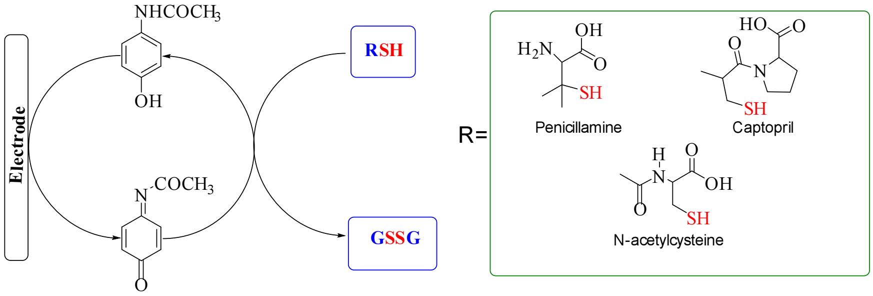
ABSTRACT

The electrochemical oxidation of acetaminophen (paracetamol) in the presence of penicillamine, captopril and N-acetylcysteine has been performed in aqueous solutions using cyclic voltammetry and controlled-potential coulometric techniques at glassy carbon electrode. Obtained results indicate that the N-acetyl-p-benzoquinone-imine (NAPQI) derived from acetaminophen oxidation participate in catalytic reaction with Penicillamine, captopril and N-acetylcysteine via EC' reaction mechanism [1, 2]convert to the corresponding product (scheme 1). In this work, we derive product with good yields based on electrochemical oxidation under controlled potential conditions in aqueous solutions, without toxic reagents and solvents at a carbon electrode in an undivided cell, using an environmentally friendly method. Furthermore, based on an EC' mechanism, the homogeneous rate constant of the chemical reaction between generated NAPQI with penicillamine, captopril and N-acetylcysteine was estimated by comparing the experimental cyclic voltammetric responses with the digital simulated results.

Keywords: Acetaminophen, Penicillamine, Captopril, N-acetylcysteine, Cyclic voltammetry, Digital simulation, EC' mechanism.



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PS107

Anomalous ionic diffusion in electroactive films: Electrochemical impedance spectroscopy investigation

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ABSTRACT

Electrochemical impedance spectroscopy (EIS) is one of the most universal and powerful electroanalytical techniques for fine characterization of chemical kinetics and transport process occurring in thin coated and ion insertion electrodes. Boundary conditions have a strong influence on the control of diffusion processes in electrochemical systems. Electrochemical impedance is one of the best techniques for monitoring the properties of film-based systems. Film electrodes are being investigated intensively in electrochemistry in relation to several attractive applications. These cells operate on the basis of two mobile charge carriers in a thin layer restricted by two planar interfaces which are permeable to different species (finite diffusion or diffusion with general boundary conditions) [1-3].

In this work, p-type Conductive polymer electroactive composite films on graphite working electrode were prepared by cyclic voltammetry and chronoamperometry. The electrochemical properties of electrosynthesized film investigated by impedance spectroscopy in frequency range of 100 kHz to 10 mHz in different dc offset potential and 5 mv alternating potential. The effect of different anions on the electron conduction of conductive polymer was explained in terms of their abilities to reduce repulsive interactions between redox sites and fractal dimension of the polymer. The main aim of this paper is to present more insight into the processes appearing during oxidation and reduction of a conductive polymer and its nanocomposite film electrode in different aqueous electrolytes, role of the electrosynthesis parameters (monomer concentration and electrolyte nature) on the kinetics and on the morphology of the film and relationship between the surface dimension of electroactive film and anomalous diffusion coefficients using electrochemical methods.

Keywords: Impedance spectroscopy, Conductive polymer, *Anomalous ionic diffusion.*

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PS108

A green galvanostatic method for the synthesis of diphenyl disulfone derivatives

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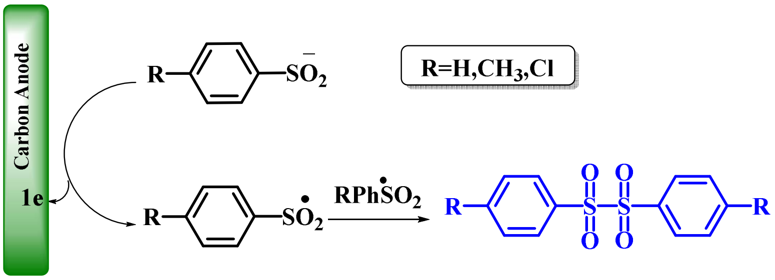
ABSTRACT

Electro-organic synthesis has recognized as a powerful tool to develop environmentally compatible processes. It is characterized by high selectivity, readily available starting materials, good atom economy, low-energy consumption and temperature, low-cost reagents and material failure. Furthermore, electrons are considered to be clean reagents [1]. Diphenyl disulfone is a mild and efficient reagent for selective cleavage of methylprenyl (2,3-dimethylbut-2-en-1-yl), prenyl (3-methylbut-2-en1yl), and methallyl (2-methylallyl) ethers [2]. In this study, the synthesis of diphenyl disulfones was performed via the constant current electrolysis in aqueous solution. In order to increase the yield of products, some affecting electrosynthesis factors have been optimized. The effects of applied current density and charge passed were investigated by setting all parameters to be constant and optimizing one each time. The highest yield was obtained at the current density of 0.21 mA cm^{-2} and charge passed 1 F/mol. The results of this work show that aryl sulfinic acids are oxidized to aryl sulfone radicals then the electrogenerated aryl sulfone radicals undergo a dimerization reaction to form diphenyl disulfone derivatives (scheme1).



scheme1

Keywords: Electro-organic synthesis, Diphenyl disulfone, Constant current electrolysis, Dimerization.

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PS109

Efficient bi-functional electrocatalyst in alkaline media for oxygen evolution and reduction reactions consist of $Co(OH)_2$ magnetic nanoflake deposited on reduce graphene oxide nanoflake

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ABSTRACT

In the peresent work, a simple method is introduced to grow cobalt hydroxide magnetic nanoflakes (MNF-$Co(OH)_2$) directly on the reduced graphene oxide nanoflake (RGONF). Firstly, the MNF-$Co(OH)_2$@RGONF have been extensively demonstrated and characterized by EDX, XRD, SEM and TEM. Then, the electrocatalytic activity of MNF-$Co(OH)_2$@RGONF in both oxygen evolution reaction (OER) and oxygen reduction reaction (ORR) were investigated in an alkaline solution [1]. The results showed that this electrocatalyst, as a non-noble metal, has an excellent catalytic activity, high durability and great potential to be adapted to the regenerative fuel cells, water splitting and metal-air batteries.

Keywords: Oxygen evolution and reduction reaction, Cobalt hydroxide magnetic nanoflakes, Reduced Graphene oxide nanoflake simple method

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PS110

Removing of carbamazepine and diclofenac from waste water with three-dimensional and two-dimensional electrochemical process

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ABSTRACT

Pharmaceuticals are continuously released into the environment. Recent studies have shown that pharmaceuticals are not removed notabley during conventional biological processes of wastewater plants [1]. Recent research show that odvanced oxidation Processes have more removal percentage of pharmaceuticals resuduals. Thus, these processes replaced conventional methods of pharmaceuticals elimination and had successes in this field [2]. the electrochemical method for wastewater treatment is of the newest applied methods which recently has been used in this concern. In this study, elimination of carbamazepine and diclofenac using two-dimensional and threedimensional electrochemical process from water are investigated. Carbamazepine and diclofenac are one of the most widely used pharmaceuticals. In this scientific essay, the batch reactor with two electrodes of Al 10-50 (cathode and anode) and current density 9 mA/cm2 is used. NaCl concentration is 500 mg/l and pharmaceutical's concentration is 5 ppm. In the three-dimension electrochemical process powder activated carbon (PAC) with concentration of 0.5 g/l as particle electrode is used. The maximum efficiency removal of carbamazepine and diclofenac in 3D electrochemical process in 10 minutes contact time was 76.59% and 39.91% respectively. In the 2D electrochemical process, the efficiency removal of carbamazepine and diclofenac in the optimum time of 50 minutes was 15.26% and 29.7%, respectively. It was found that in 3D electrochemical process, super oxidants are responsible for about %50 of removal process

Keywords: Carbamazepine, Biclofenac, Removal, 3D Electrochemical, 2D Electrochemical

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PS111

Electrodeposition of Pt nanoparticles on modified electrodes with metal oxide and investigation of their performance in oxidation of Methanol

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ABSTRACT

Catalyst support materials exhibit great influence on the cost, catalyst activity, and durability of direct alcohol fuel cells. in this research electrodes were prepared from metal oxides (SnO_2 and Sb doped SnO_2) on titanium substrate (Ti) as a new support meterial for Pt catalyst in order to electro-oxidation of methanol. platinum nanoparticles were deposited on metal oxide film that was deposited on the Ti electrode via electro reduction of platinum salt in an acidic solution. The Physical morphology of modified electrodes was evaluated by scanning electron microscopy (SEM) and energy dispersive X-ray analysis (EDX) techniques. The electrocatalytic behaviour of this type of electrodes for methanol oxidation reaction (MOR) and oxidation of carbon monoxide (CO) absorbed on Pt was considered with cyclic voltammetry and electrochemical impedance spectroscopy of catalyst in 0.5 mol L^{-1} H_2SO_4 aqueous solution. The results of the electrochemical analysis reveal that Pt/Sb-SnO_2/Ti has a high catalytic activity for oxidation of methanol and CO absorbed on Pt. Electrochemical surface area (ECSA) of a platinum electrocatalyst is measured by cyclic voltammetry in 0.5 mol L^{-1} H_2SO_4 aqueous solution.. The doping of SnO_2 with Sb improves ECSA and MOR activity, which act as electronic donors to increase electronic conductivity.

Keywords: Pt nanoparticles, Electrodeposition method, Methanol oxidation, Support materials

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PS112

Large-scale synthesis of graphene and graphene oxide using electrochemical method

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ABSTRACT

In the last decade, graphene and graphene oxide (due to their unique properties) have become one of the most exciting research topics in different science fields. In this study, an efficient, cost-effective and simple approach to produce graphene and graphene oxide using an electrochemical method is reported. The electrolyte concentration, applied voltage, electrode distance and preparation time were taken as control parameters to optimize the produced graphene and graphene oxide. Surface morphology, layer thickness and characteristics of prepared samples were investigated by scanning electron microscopy , atomic force microscopy , transmission electron microscopy , X-ray diffraction , Raman and FTIR. In addition, some important parameters such as the interlayer spacing, crystallite size and the average number of layers also were determined by X-ray powder diffraction(XRD). The obtained results confirmed the graphene and graphene oxide structures. In addition, the prepared graphene samples showed high performance in electrochemical saving energy.

Keywords: Graphene, Graphene oxide, Electrochemical synthesis, Electrochemical saving energy

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PS113

Electrochemical reduction study of nitrophenol and nitroaniline in water at room temperature

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ABSTRACT

Aromatic nitro compound such as nitrophenol and nitroaniline important group of compounds that were used in pharmaceuticals, paint, insecticides and pesticides but they are very toxic substance that are present in water and environment [1] so reduction of nitro group and convert them to other functional components with a simple, inexpensive, non-free solvent and any catalyst method is very important. [2] In the same manner, electrochemical behavior of p-Nitrophenol (PNP), the Cyclic Voltamogram
(CV) exhibits two anodic (A1, A2) and fore cathodic peaks (C0, C1, C2 and C'2). Peak C0 is related to the reduction of PNP to hydroxylamine species results from a 4e-,4H+ . Peak (A1) is observed for oxidation of the phenol group to quinoneimine and (C1) is corresponds quinoneimine to *p*-aminophenol via a 2e-, 2H+.As can be seen, the anodic peak (A2) and the corresponding cathodic peak (C2, C'2) were obtained, which corresponds to the transformation of hydroxylamine species to *p*-amino phenol within an irreversible two-electron process.
P-Nitro aniline (PNA). the CV exhibits one anodic (A1) and two cathodic peaks (C0 and C1). Peak C0 is related to the reduction of *p*-nitroanilin to hydroxylamine species results from a 4e-,4H+. Peak (A1) is observed for oxidation of the phenol group to quinoneimine and (C1) is corresponds quinoneimine to *p*-aminophenol via a 2e-, 2H+.

Keywords: Aromatic nitro compound, Nitroaniline, Nitrophenol, Hydroxylamine, Cyclic voltamogram

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PS114

Electrochemical oxidation of fast blue BB in the presence of arylsulfinic acids: A green approach for the electrochemical synthesis of unsymmetrical diaryl sulfones

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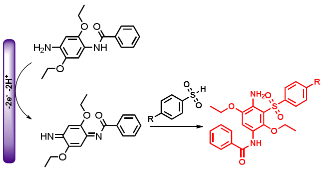
ABSTRACT

Aryl and diaryl sulfones has attracted much attention in agrochemicals, medicinal chemistry, biological activities [1,2]. Also, aryl sulfones are found in various drugs such as 4,4-diamino-diphenyl sulfone (dapsone) [3]. Our interest in the design and electrochemical synthesis of new compounds prompted us to synthesize new molecules similar to dapsone under mild and ambient conditions. Electrochemical oxidation of fast blue BB (FBBB) has been studied in different pH value .It was found that the half wave potential ($E_{1/2}$) shifted to the negative potentials by increasing pH. In addition, we investigated electrochemical oxidation of FBBB in the presence of arylsulfinic acids as nucleophiles in aqueous solutions using cyclic voltammetry and controlled-potential coulometry methods. The decrease in I_{pC_1} indicates that the product of electrooxidation of FBBB is consumed by a chemical reaction with arylsulfinic acids. The coulometry progress was monitored using cyclic voltammetry. It was found that, proportional to the progress of coulometry, all of anodic peaks decreased. These peaks disappeared when the charge consumption was 2.0 e^- per molecule of FBBB. The data show that $FBBB_{ox}$ was converted to the unsymmetrical diaryl sulfones by Michael type addition reaction with aryl sulfinic acids (Scheme 1). This work has led to the development of a high yield, green, reagentless, one-pot and facile electrochemical method for the synthesis of the described sulfones.



Scheme 1

Keywords: Electrochemical synthesis, Fast blue BB, Diaryl sulfones.

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PS115

Multicomponent synthesis of pyrano pyrimidine derivatives by electrosynthesis

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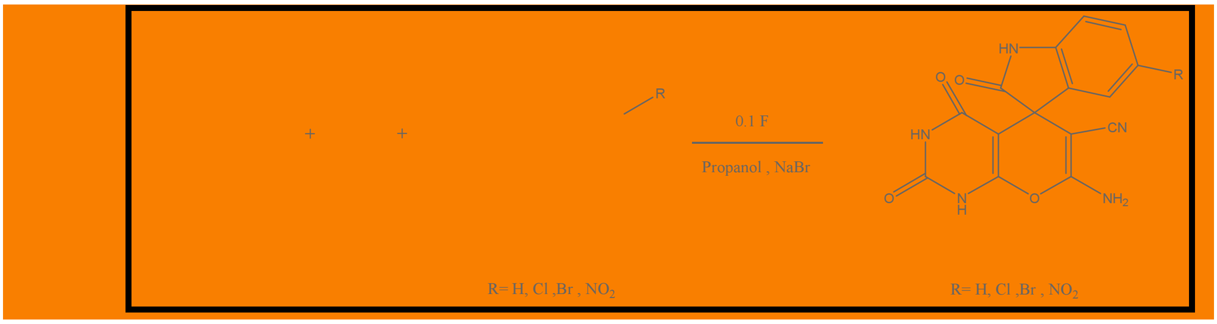
ABSTRACT

A simple, efficient and environmentally being method for the electrosynthesis of pyrano pyrimidine derivatives is presented. Three component reaction of a pyrimidine-2,4,6-trione (barbituric acid), malononitrile and isatins in propanol at room temperature offered the corresponding 7'-amino-2,2',4'-trioxo-1',2',3',4'-tetrahydrospiro(indoline-3,5'-pyrano-2,3-pyrimidine)-6'-carbonitrile derivatives with excellent yields (90-96%) in a short reaction time.



Keywords*:* Barbituric acid, Electrosynthesis, Isatin, Three component reaction, Pyrano pyrimidine

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PS116

An effective sensor for electrooxidation of oxalic acid using Ag-incorporated ZSM-5 nanozeolites

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ABSTRACT

A new sensor is reported based on silver incorporated in ZSM-5 nanozeolite (Ag/ZSM-5/CPE) for catalytic electrooxidation oxalic acid (OA). ZSM-5 nanozeolites were prepared using silica nano extracted from bagasse (BGA) as silica source and were characterized by the X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared (FT-IR), Brunauer–Emmett–Teller (BET), Barrett-Joyner-Halenda (BJH) and energy dispersive X-ray (EDS). Accumulated spherical nanozeolites were formed with range of almost particle size of 80-160 nm. This sensor was used to study the electrocatalytic oxidation of OA with different methods such as cyclic voltammetry, differential pulse voltammetry and amperometry. In addition to, amperometric studies showed that this sensor can detect OA in linear ranges of 14 µM – 0.16 mM and 0.16–4.2 mM with a detection limit of 5.2 µM (S/N=3). The sensor had advantages such as, wide linear range, high sensitivity and low detection limit. Spinach and cabbage were used as real samples for determination of OA in real samples. It is concluded that that no interfering species interfere on OA measurement.

Keywords: Extraction of nano silica, Bagasse, Oxalic acid, ZSM-5 nanozeolite, Sensor.

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PS117

Copper (II) complex based on 4,4′- bithiazoles: Synthesis, characterization and electrochemical investigations

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ABSTRACT

Copper is the third most abundant element in human body after iron and zinc. copper and its complexes are good for liver function, its level in blood and urine has influenced in pregnancy disorders, nephritis hepatitis, leprosy, anemia and leukemia in children. Over a dozen of enzymes depend on copper. It was found that aromatic heterocyclic containing bithiazole rings are good ligands because the two nitrogen atoms in the bithiazole rings are able to chelate metal ions to form stable five member rings.Transition metal complexes of bithiazole or its derivatives have interesting properties and potential applications in many fields.

This article focuses on the simple synthetic preparation of a new Cu(II) bithiazole complex. New complex was produced by using Cu(II) salt and DADMBTZ in an efficient and quick way. The new complex was characterized by ^{1}H-NMR, ^{13}C-NMR, and FT-IR spectroscopy. Copper (II) complex was structurally characterized by single crystal X-ray diffraction. The thermal stability of new complex was studied by thermal gravimetric (TG) and differential thermal analyses (DTA). The compound was further characterized by UV-visible spectrophotometric measurements. Electrochemical properties of obtained bithiazole complex were investigated using cyclic voltammetry. Electrochemical studies revealed the Cu(II)/Cu(I) redox process.

Keywords: Electrochemical, Copper (II), Complex, Bithiazole

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PS118

Performance of *pistacia khinjuk* extract on the corrosion of AA5052 aluminum alloy in NaCl medium

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ABSTRACT

AA5052 aluminum due to excellent processing features, is one of the most common aluminum alloys. But, its resistance to corrosion in environments containing chloride ions is low. The use of corrosion inhibitors, is the most common methods for corrosion protection of metals [1, 2]. Due to toxicity and synthesis limitations of some materials which used as corrosion inhibitors, eco-friendly materials are interested [3, 4].

In this study, *Pistacia khinjuk* extract as a non-toxic inhibitor was evaluated to protect against corrosion of aluminum in 3.5 % NaCl solution. In this regard, electrochemical methods such as potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) were used. After ensuring the good performance of extract, the metal surface using methods such as field-emission scanning electronic microscopy (FE-SEM) and energy-dispersive spectroscopy (EDS) was investigated. The obtained results proved that the surface of aluminum was covered with adsorption of molecules of extract or adsorbed on the surface ofaluminum. After obtaining the coverage surface (ϴ), different types of adsorption isotherms were tested. The results showed that the extract is adsorbed on the surface of aluminum according Langmuir adsorption isotherm. The effect of temperature on the corrosion inhibition effect *Pistacia khinjuk* extract was also studied by using potentiodynamic polarization method in the temperature range of 25-65 °C. Then kinetic and thermodynamic parameters were discussed.

Keywords: Corrosion inhibitor, AA5052Aluminum, 3.5 % NaCl,. Electrochemical impedance spectroscopy, *Pistacia khinjuk* extract

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PS119

Raising the corrosion protection efficiency of graphene via aryl diazonium salts: Comparison between type of aryl substitution with different spatial situation

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ABSTRACT

Recently, we showed reduced graphene oxide acts as a protective film to avoid corrosion, however defects in graphene layers on the surface can be the initiation corrosion sites and diffusion pathways of O_2 and H_2O for substrate corrosion [1]. In the present study corrosion protection efficiency (PE%) of graphene-coated carbon steel (CS/G) was raised via modifying the surface of by using aromatic molecules. Phenyl groups with three different substitutions including -COOH, $-NO_2$ and $-CH_3$ grafted to graphene via carboxy phenyl diazonium (CPD), nitro phenyl diazonium (NPD), and methyl phenyl diazonium (MPD) salts in ortho, meta and para spatial situations. Molecular bindings were characterized by FT-IR, XRD, SEM/EDXA, and Raman techniques. Anti-corrosion performance of samples was evaluated by weight loss and electrochemical methods such as Tafel and EIS techmiques in NaCl 3.5 % solution. Also, the hydrophobic ability of coatings was evaluated using water contact angles measurements. The results showed that restored graphene coatings offer a better PE% than the non-restored graphene. Defect restoration of graphene impede the corrosion reaction by covering the initiation corrosion sites on the CS surface via the assembling of hydrophobic functions like phenyl groups [2]. Substitution on phenyl groups can affect charge transfer resistance (R_{ct}), corrosion potential (E_{corr}), current density (I_{corr}) and the slope of the anodic and cathodic reaction ($\beta_{a,c}$). The obtained results proved that PE% was observed in order CS/G-CPD<CS/G-NPD<CS/G-MPD. The different behaviors between them can be explained by hydrophilicity or hydrophobicity nature of the end top phenyl functional groups [3]. Also MPD in para spatial situation, showed the maximum PE% of 98.6% in comparison to other substitutions. Observed results can be interpret by the minimum steric hindrance of para substitutions in grafting process of diazonium salts onto the graphene sheets [2].

Keywords: Graphene, Diazonium salts, Carbon steel, Corrosion, Surface modification.

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PS120

Effect of aryl diazonium salts on enhancement of corrosion protection efficiency of graphene: Comparison between number of phenyl rings and azo groups

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ABSTRACT

Recently we reported barrier properties of graphene layer made by electrochemical reduction of produced graphene oxide nanosheets [1]. In the present study we have developed a method of coating carbon steel (CS) surface with modified graphene layer for corrosion protection. Modification of the graphene-coated CS surface (CS-G) via diazonium formation route was carried out by attachment of phenyl groups using phenyl diazonium (PD), 1-naphtyl diazonium (1-ND), and 1,8 naphtalene diazonium (1,8-ND) compounds to provide a more anticorrosive barrier that blocks gases, liquids and aggressive chemicals. The coatings were characterized by FT-IR, Raman, XRD, SEM-EDX and TEM techniques. The anti-corrosion performance of the coated layers was evaluated by weight loss and electrochemical methods such as potentiodynamic polarization and electrochemical impedance spectroscopy in NaCl 3.5%. Also, the hydrophobic ability of coatings was evaluated using water contact angles measurements. The results showed that modified graphene coatings offer a better PE% than the non-modified graphene. Defect restoration of graphene impede the corrosion reaction by covering the initiation corrosion sites on the CS surface via the assembling of hydrophobic functions like phenyl groups [2,3]. Moreover, the number of phenyl rings and azo groups ($-N_2$) can affect charge transfer resistance (R_{ct}), corrosion potential (E_{corr}), current density (I_{corr}) and the slope of the anodic and cathodic reaction ($\beta_{a,c}$). The obtained results proved that the diazonium salts with 2 phenyl rings shows higher PE% than those of with 1 phenyl ring. Probably it is due to the formation of more impact protective layer. In addition, the diazonium salts with 2 azo groups demonstrates higher PE%. Because the grafting of diazonium salt to graphene layer is performed via evolution of N_2 and formation of covalent C-C bonds [4]. Finally the obtained results showed that PE% was observed in order CS/G-1,8ND<CS/G-1ND<CS/G-PD.

Keywords: Aryl diazonium salts, Graphene, Corrosion, Surface restoration, Carbon steel.

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PS121

Evaluation of anticorrosion performance of poly vinyl alcohol-Fe_3O_4 (PVA/Fe_3O_4) nanocomposite on carbon steel in NaCl 3.5%

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ABSTRACT

Application of nanomaterials in the corrosion protection of metals has recently gained, due to reduce the impact of corrosive environments through the alternation of the metal/electrolyte interface and magnetite (Fe_3O_4), as one of the most promising nanoparticles, and the corrosion products, that can employ in anticorrosion coatings [1-3]. Herein, a nanocomposite of poly vinyl alcohol and magnetite (Fe_3O_4) nanoparticles (PVA/Fe_3O_4) were prepared in different mass ratios. Prepared Fe_3O_4/PANI nanocomposites were characterized by FT-IR, XRD, TEM, SEM and EDXA. A thin layer of the PVA/Fe_3O_4 nanocomposites were used to coating carbon steel (CS) as corrosion protector film in NaCl 3.5%. Anti-corrosion performance of the PVA/Fe_3O_4 nanocomposites was investigated through electrochemical techniques such as potentiodynamic polarization and electrochemical impedance spectroscopy (EIS). Observed results showed a dramatic shift in corrosion potential and a decrease in cathodic and anodic reactions rate in Tafel plots. Also, EIS data showed charge transfer resistance was increase after coating the carbon steel with PVA/Fe_3O_4 nanocomposite. Affecting parameters like mass ratio, amount of nanocomposite, and film formation time, were optimized. Our electrochemical results showed an outostanding protection efficiency in 3.5% NaCl for CS. Finally ability of proposed coating as an anticorrosive layer was further proofed by using surface methods i.e. SEM and EDXA. Observed results will be presented and discussed.

Keywords: Corrosion, poly vinyl alcohol, Fe_3O_4 nanoparticles, Nanocomposite, 3.5% NaCl, EIS.

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PS122

Cathodic electrosynthesis of $ZnMn_2O_4/Mn_3O_4$ composite nanostructures for high performance supercapacitor applications

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ABSTRACT

Supercapacitors have been identified as a new generation of efficient energy storage devices due to their long cycle life, high power density, and rapid charge-discharge rate [1]. Transition metal oxides with different oxidation states are widely used as electrode materials in supercapacitors where the charge is stored through internal redox reactions [2]. High abundance, environmental friendliness, different oxidation states, and low cost make manganese oxides suitable candidates for supercapacitor applications [3]. In this study, $ZnMn_2O_4/Mn_3O_4$ composite nanostructures were prepared by cathodic electrodeposition followed by heat treatment. A mixed hydroxide precursor was galvanostatically electrodeposited from aqueous solution containing Mn and Zn (as nitrates) and the obtained precursor was annealed to prepare the composite. This composite exhibited much better electrochemical behaviors than bare Mn_3O_4. Rietveld analysis of the X-ray diffraction (XRD) data showed that the product was composed of Mn_3O_4, $ZnMn_2O_4$ and minor amounts of λ-MnO_2. Furthermore, the obtained composite was characterized by FT-IR, EDS and FE-SEM. Electrochemical performance and ion transport of $ZnMn_2O_4/Mn_3O_4$ composite were studied via galvanostatic charge-discharge (GCD) cycling and electrochemical impedance spectroscopy (EIS). Cyclic voltammetric (CV) measurements showed a maximum specific capacitance of 273.71 F/g at the scan rate of 1 mV/s. 93% of this specific capacitance was retained after 2000 cycles.

Keywords: $ZnMn_2O_4$; Mn_3O_4; Electrosynthesis; Nanorods; Supercapacitor

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PS123

A facile one pot synthesis of cobalt-manganese MOF: electrode materials for supercapacitor with excellent areal capacitance and remarkable electrochemical stability

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ABSTRACT

With the investigation the history of different researches, also importance of the metal organic frame work (MOF) structure in different fields, especially energy storage systems, it seems that these materials are very good candidates for supercapacitors. So in this research metal organic framework nanostructure based on two different metals and dicarboxylic acid organic linker with ability to obtain network structure synthesized and placed on collector as electrode and utilized in supercapacitor system. After optimization the molar ratio of twometals in synthesis of MOF, electrochemical investigation was carried out and specific capacitance at scan rate of 5 mV/s was obtained as 2.375 F.cm^{-2}. Our studies revealed that the bimetallic MOF supercapacitor considerably shows the higher specific mass and areal capacitances compared to the single metal based MOFs. Also stability investigation of this nanostructure by Cyclic voltammetry method at scan rate of 100 mV/s displayed 85% of initial capacitance value remained after 3000 cycles.

Keywords: Electrochemical supercapacitor, Metal organic framework, energy storage systems.

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PS124

Improving the performance of dye-sensitized solar cells using an organic dye as a co-adsorbent

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ABSTRACT

Dye sensitized solar cell (DSC) is one type of photovoltaic cell, which used widely because of their low cost value and environmental friendly [1, 2]. Organic dyes have attracted great attention due to their excellent photovoltaic performance in dye-sensitized solar cells (DSSCs). In this study, methyl red organic dye was used as a co-adsorbent in combination with N719 dye. As it is obvious from the results, the optimized concentration of the co-absorbent leads to highest efficiency. The DSSC characteristics were determined for the cells dyed with a concentration of 0.5 mM by the following results: J_{sc} = 14.87 mA/cm^2, V_{oc} = 0.765V, and η = 5.2%. A higher η value of the co-adsorbent solar cells was assigned to its enhanced short-circuit current (J_{sc}), which is due to reduced dye aggregation, improved light-harvesting efficiency, high electron injection rate and charge collection, as well as its increased open-circuit voltage (V_{oc}), which is due to the improved electron density in the TiO_2 conduction band of the photoanode.

Keywords: Dye-sensitized solar cell, Co-adsorbent, Charge recombination

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PS125

Investigation of hot pressing parameters for manufacturing of catalyst-coated membrane electrode for polymer electrolyte membrane fuel cells by response surface method

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ABSTRACT

This paper presents the results of investigations to develop an optimized in-house catalyst coated membrane electrode (CCME) assembling technique. The hot-pressing conditions of the CCME of a proton exchange membrane fuel cell in this preparation technique were investigated by using a central composite design. The influence of CCME fabrication parameters like hot pressing parameters on performance of hydrogen fuel cells were studied by cathode half cell measurements. Compression pressure, temperature and time duration were key parameters that were varied from 500 to 1500 psi, 1 to 5 min and 100 to 140 ºC, respectively. The CCME was prepared with a Nafion 117 membrane and gas diffusion layer having an active area of 0.785 cm^2 with Pt/MWCNT catalysts of 0.1 mg cm^{-2} loading at the cathode side. The design of experiment work was performed with the response surface method using the central composite design. The results show that the proposed mathematical model in the response surface method can be used adequately for prediction and optimization within the factor levels investigated. The combined optimum hot pressing parameters that gave the highest performance of 22.9 mW cm^{-2} predicted in this study are 500 psi, 93 °C and 5 min.

Keywords: PEMFC, CCME, Half call, Design of experiment, Response surface method

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PS126

Preparation of Pt/Nb-SnO_2/Ti electrode by electrodeposition method and its electrochemical performance for methanol oxidation

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ABSTRACT

Electrode consisting of Pt nanoparticles deposited on thin films of niobium doped tin oxide (Pt/Nb-SnO_2) was prepared onto titanium substrates by an electrodeposition method. The physical characterization of these electrodes (Pt/Ti and Pt/Nb-SnO_2/Ti) was carried out by scanning electron microscopy (SEM) and energy dispersive X-ray analysis (EDX). The general aspects of the electrochemical behavior were studied by cyclic voltammetry and electrochemical impedance spectroscopy in 0.5 mol L^{-1} H_2SO_4 aqueous solution. The response of these electrodes in relation to the oxidation of methanol and carbon monoxide absorbed on Pt active sites in acidic media was studied. By the use of cyclic voltammetry, the electrochemical surface area (ECSA) of a platinum electrocatalyst is measured by hydrogen adsorption. ECSA of Pt/Nb-SnO_2/Ti electrode compared to Pt/Ti electrode was increased that caused this electrode exhibited the high activity for methanol electro-oxidation and CO stripping experiments.

Keywords: Pt nanoparticles, Electrodeposition method, Nb doped SnO_2, Methanol electro-oxidation

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PS127

Design and fabrication of electrochemical supercapacitors with use of modified carbon mesoporous.

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ABSTRACT

A highly defective mesoporous carbon (DMC) was synthesized via a facile mass producible method for the application of supercapacitor. The studies show that defective mesoporous carbon (DMC) has good electro-catalytic properties in comparison to other carbon nano tubes and Graphene. High porosity and optimum pore size distribution is the main advantages of these Nano pores. All these features has lead that DMC becomes the most exciting topic of research in the field of super capacitors.

The preparation of DMC with desired structural defects was conducted using nanosilica as hard template, sucrose as a carbon source, and KNO_3 as a defect causing agent. During carbonization process, the oxygen gas released from the decomposition of KNO_3, which was coated on nanosillica template, reacts with carbon atoms and provides a highly defective mesopores carbon. Raman spectroscopy was used to evaluate defect density while porous structure and surface morphology of synthesized materials were investigated with N_2-adsorption/desorption, XRD, SEM and TEM techniques.

To make the DMC electrode we use DMC, carbon black as filler and poly tetra-fluoro Ethylene as binder of DMC to nickel foam with the help of two methods. The first one is the floatation of DMC in acetone and the next one is making of carbon past and the capacitive behavior of DMC was investigated by cyclic voltammetry. The calculated capacitance for DMC is 290 F/g that shows good value as super capacitor. The researchs shows that DMC has good specific capacitance and rate capability via large surface area and defective structure.

Keywords: Supercapacitor, Defective mesoporous carbon(DMC), KNO_3, Carbon paste, Specific capacitance

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PS128

Construction of nanocomposites based on mesoporous carbon and phenazine polymers as a plateform for platinum nanoparticles: Application for electrocatalytic oxidation of methanol

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ABSTRACT

Here we report a simple, facile, low cost, environmental friendly and one step method for dispersion of platinum nanoparticles at the surface of glassy carbon electrode to fabricate a modified electrode for methanol oxidation. The Pt nanoparticles-brilliant cresyl blue-CMK-3 (Pt-PBCB-CMK-3) was synthesized using cyclic voltammetry. The electrocatalytic activity of Pt-PBCB-rCMK-3/GC has been measured respect to Pt-PBCB/GC, Pt-rCMK-3/GC and Pt/GC. These electrocatalysts characterized by field emission scanning electron microscopy (FESEM), energy dispersive spectroscopy (EDS), Fourier transform infrared spectroscopy (FT-IR) and electrochemical methods. A comparison between the synthesized electrodes revealed that the Pt-PBCB-rCMK-3/GC electrode have the best electrocatalytic activity for methanol oxidation compared to the other electrodes. This enhanced activity could be attributed to the synergism effect of the BCB and CMK-3.

Keywords: Methanol oxidation, Conducting polymers, Mesoporous carbon

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PS129

Electrosynthesis and characterization of nanostructures Ni (Co, Zn); Appliction in supercapacitors

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ABSTRACT

There has been growing interest in the study of nano materals in recent years due to their potential applications in many different areas of science and technology . Doping is an effective and facile method to modify the physical properties (e.g. optics, magnetics and electricity) of the base materials and this will extend the applications of the base materials. For instance, Ni(OH)2 has poor electrical conductivity that limits its high rate performance and cycle life. So, addition of Co into Ni(OH)2 can increase the electrical conductivity of the final Co-Ni(OH)2 hybrid. Therefor, metal hybrid materials, are expected to possess higher electrical activity and good pseudocapacitive characteristic [1]. In this work, some mixed binary systems Ni-Co and Ni-Zn were synthesized by cathodic deposition on steel electrode at a room temperature in galvanoststic mode. The resultants were characterized by variety of methods including X-ray diffraction (XRD) and scanning electron microscopy (SEM). These mixed binary systems will be used for fabricating supercapacitors.

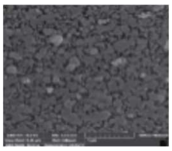

Fig 1. SEM of binary metal oxide Ni-Co

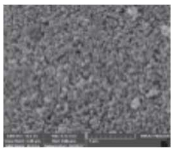

Fig 2. SEM of binary metal oxide Ni-Zn

Keywords: Electrosynthesis, Cathodic deposition, Mixed binary system

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PS130

Binder-free nickel-cobalt hydroxide nanostructures coated on graphene nonosheets /nickel foam for preparation of high performance supercapacitors

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ABSTRACT

demand for more efficient energy storage devices stimulates the efforts to search and develop new materials and composites with promising properties. In this regard, composite materials, including carbonaceous materials and metal oxides have attracted a great attention due to better electrochemical performance as compared to their single material analogues.[1-4] Herein, for the first time, we report a new and simple procedure for preparing reduced graphene oxide/nickel, cobalt hydroxide nanocomposite (rGO/Ni/$Co_2(OH)_4$) via a fast and simple two-step electrochemical procedure including potentiostatic routes. In the first step, a piece of the cleaned nickel foam (NF) (size: 3cm × 3cm) immersed in a suspension of graphene oxide (GO, 6 mg/L) and then sonicated for an hour and finally dried in an oven at 60 ˚C overnight. Then, the prepared GO/NF electrode was subjected to NaOH solution (3M) at a constant potential of 3V for 10 min to reduce graphene oxide as rGO/NF. After that, the resulting substrate which was coated with graphene nanosheets, was put into the solution containing nickel/cobalt with a molar ratio of 1:2 in the presence of Cetyl trimethyl ammonium bromide (C-TAB) and subjected to cyclic voltammetry technique in the potential range of 0 to -1.5 V for 10 cycles. The resulting modified electrode afforded extremely high specific capacitance of 1732.7 F/g at a current density of 5 A /g. Also, the resulting modified electrode has low resistance, and a porous structure to facilitate the charge transfer, respect to the electrode without surfactant (C-TAB).

Keywords: Graphene oxide, Supercapacitor, Reduce graphene oxide/nickel-cobalt hydroxide, Surfactant

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PS131

Norepinephrine determination using carbone paste electrode modified with core shell nanoparticles and modifier

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ABSTRACT

Norepinephrine (NE), acetaminophen (AC) and tryptophan (Trp) are important human body compounds that play determining role in metabolism [1], hence, monitoring their concentration in biologic fluids such as blood and urine may prevent and control many diseases. These are electrochemically active compounds that can be determined by different techniques. In recent years, the development of voltammetric methods for their determination in human body fluids such as urine and serum has received considerable interest. However, at bare electrodes NE, AC and Trp are oxidized at nearly the same potential, which result in overlapped voltammetric responses making their simultaneous discrimination highly difficult. Thus, it is essential to develop reliable methods with good sensitivity and selectivity for simultaneous determination of NE, AC and Trp in routine analysis. In this work, a sensitive and selective electrochemical method for the determination of NE, AC and Trp was developed using a modified carbon paste electrode (MCPE) with 2-(4-ferrocenyl-[1,2,3]triazol-1-yl)-1-(naphthalen-2-yl) ethanone and manganese ferrite core shell magnetic nanoparticles (CSMNPs). The electrochemical response characteristics of the modified electrode toward NE, AC and Trp were investigated by cyclic and square wave voltammetry. It has been found that under optimum condition (pH= 6.0) in cyclic voltammetry, the oxidation of norepinephrine occurs at a potential about 60 mV less positive than that of an unmodified carbon paste electrode. The modified electrode exhibits an efficient electron mediating behavior together with well-separated oxidation peaks for NE, AC and Trp. Under the optimum conditions in 0.1 M phosphate buffer solution, the square wave anodic peak current showed a linear relation versus NE concentration in the range of 7.5×10^{-8} – 6.0×10^{-5} M and a detection limit of 1.6×10^{-8} M. Sub-micromolar detection limit and high reproducibility, together with ease of preparation and regeneration of the electrode surface by simple polishing, make the electrode very suitable for the determination of NE in pharmaceutical and clinical preparations.

Keywords: *Norepinephrine, Acetaminophen, Tryptophan, Core–shell magnetic nanoparticle, Electrocatalytic, Carbon paste electrode, Modifier*

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PS132

A multiwall carbon nanotube- nickel hydroxide nano-particles modified glassy carbon electrode for a sensitive determination of dopamine

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ABSTRACT

Dopamine (DA) is one of the excitatory neurotransmitters. DA plays an important physiological role in the functioning of central nervous system. [1, 2]. The loss of DA in human body may lead to some serious diseases such as Parkinson's diseases and schizophrenia [3, 4]. Therefore, determination of DA is significant for neurochemistry and brain science studies.

In this work a chemically modified electrode is constructed based on multi-walled carbon nano-tube (MWNTs) and nickel hydroxide nano-particles (NHNPs) composite modified glassy carbon electrodes. The proposed electrode is evaluated as the electrochemical sensor for simultaneous trace determinations of DA in pharmaceutical and biological samples. The measurements and electrochemical characterization of DA on the modified electrode was investigated using cyclic voltammetry (CV) and differential pulse voltammetry (DPV) methods in phosphate buffer solution (pH=6.5). The new modified electrode displayed excellent catalytic function for the oxidation of DA. The effect of various experimental parameters on the voltammetric response of dopamine was investigated. Under the optimum conditions, the calibration curves for DA was linear for the whole concentrations range investigated as 0.5–850 µM. The modified electrodes revealed some advantages such as simple fabrication procedure, good regeneration and stability of the electrode, high sensitivity, short response time and wide linear range.

Keywords: Dopamine, Nickel hydroxide nano-particles, Multi-walled carbon nano-tube

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PS133

Electrochemical investigation and determination of theophylline using a glassy carbon electrode modified with a nano-composite of reduced grapheneoxide and β-cyclodextrin

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ABSTRACT

Theophylline is a kind of methyl xanthine derivatives which exists widely in nature. It has been reported that theophylline is a widely used drug in treatment of asthma and chronic bronchospasm of adults [1]. The effective concentration of theophylline is 5–20 μg/mL (55–110 μM) [2]. Up to now, a number of analytical methods, such as capillary electrophoresis, thin layer chromatography, high-performance liquid chromatography and spectrophotometry are developed for the determination of Theophylline. However, these methods have some disadvantages such as low sensitivity and poor selectivity. Instead, electrochemical methods are excellent alternative for the determination of Theophylline because of their simple and fast response, high sensitivity, without the time-consuming extraction steps, cost effective.Here in this study a simply electrochemical sensor based on glassy carbon electrode modified with a composite made from reduced graphene oxide and β-cyclodextrin was developed to determine theophylline using cyclic voltammetry and differential pulse voltammetry. Theophylline showed a well-defined oxidation peak at the fabricated electrode in phosphate buffer solutionand the oxidation peak current is much higher than that at the bare GCE, indicating that composite caneffectively improve the oxidation of theophylline. Several effect factors on theophylline determinationwere optimized, such as solution pH, scan rate and accumulation time. Under the optimalconditions, the oxidation peak current of theophylline was proportional to its concentration in the rangeof 2-7×10^{5}nMwith detection limit of1nM.

Keywords: Theophylline, Differential pulse voltammetry, Electrochemical oxidation

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PS134

Core–shell magnetic nanoparticle based electrochemical sensor for determination of dopamine and uric acid

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ABSTRACT

Dopamine (DA) and uric acid (UA) are important human body compounds that play determining role in metabolism [1], hence, monitoring their concentration in biologic fluids such as blood and urine may prevent and control many diseases. In recent years, the development of voltammetric methods for their determination in human body fluids such as urine and serum has received considerable interest. However, at bare electrodes DA and UA are oxidized at nearly the same potential, which result in overlapped voltammetric responses making their simultaneous discrimination highly difficult. Thus, it is essential to develop reliable methods with good sensitivity and selectivity for simultaneous determination of DA and UA in routine analysis. Among the methods, chemically modified electrodes (CMEs) with metal nanoparticles are becoming popular ways because of the characteristics such as easier fabrication process, more excellent electrochemical catalytic ability and physical stability [2]. Some advantages of using the modified electrode are ease of preparation, low cost, potential window, ease modification, excellent electrical conductivity and increasing the surface of the electrode [3].

In the present work, after the synthesis of the modifier and core–shell magnetic nanoparticles, a nanoparticle modified carbon paste electrode was prepared. The modified electrode was studied for the DA voltammetric responses in the presence of UA. The electrochemical response characteristics of the modified electrode toward DA and UA were investigated by cyclic and square wave voltammetry. The results were showed that, the oxidative potentials of DA and UA could be separated by the modified electrode, thereby enabling the independent determination of DA in the presence of UA.

Keywords: Dopamine, Uric acid, Core–shell magnetic nanoparticle, Electrocatalytic, Carbon paste electrode, Modifier

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PS135

Electrochemical detection of catechol using Al_2O_3 nanofibers, gold nanoparticles and graphene oxide

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ABSTRACT

Phenolic compounds, which are widely used in various fields such as textiles, paints, plastics, oil refineries, cosmetics, antioxidants, pesticides, pharmaceuticals and photography [1]. These compounds have been considered by the United States as well as environmental pollutants even at very low concentrations, and are highly toxic to human health. Environmental Protection Agency and the Europe Union have announced that high concentrations of hydroquinone can be headache, fatigue, tinnitus, dizziness, nausea, edema, internal organs and skin inflammation in humans. Skin touching with catechol causes eczema in humans [2]. There are several interesting features in the sensors making us select them as monitoring tools such as simplicity, accuracy, reliability and reasonable cost determination of different analysts as well as they operate as an effective analytical tool in the quality control of food, high sensitivity and selectivity [3,4]. A novel electrochemical electrode for the determination of catechol was investigated based on a glassy carbon electrode modified by alumina nanofiber, gold nanoparticles, and the mixture of (graphene oxide) GO/chitosan. Nanofibers were electrodeposited onto GO/chitosan with gold nanoparticle electrodeposition. The sensor has been used for determination of catechol and had a good results. The fabrication process of the sensing surface was characterized by scanning electron microscopy (SEM), Fourier transform infrared spectroscopy, cyclic voltammetry. pH 3 was the optimum pH and electrochemical behavior was investigated in pH3. The limit of obtained 11 µM. The results showed that there are no significant interference from many common cations and anions such as Ca^{2+}, Br^{-}, Cl^{-}, SO_4^{2-}, K^{+}, Na^{+} and some phenolic compounds.

Keywords: Nanofiber; Phenolic compounds; Electrochemical behavior

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PS136

The electrochemical behavior of carbon quantum dots prepared by dopamine

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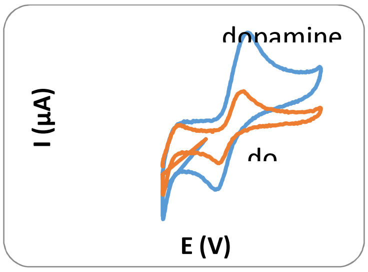
ABSTRACT

Carbon quantum dots (CQDs) with good stability and excellent biocompatibility, as a carbon-based nanomaterial, have begun to play an increasingly important role in electrochemical biosensors. In the present study, CQDs were prepared by hydrothermal treatment of dopamine at 180 °C for a period of 6 h. The obtained dopamine-quantum dots were collected by removing the large dots through centrifugation at 10000 rpm for 10 min. The electrochemical behavior of the dopamine-quantum dots was investigated by cyclic voltammetry using a carbon paste electrode (CPE) as working electrode. The cyclic voltammogram of the quantum dots showed a redox couple with formal potential of 0.181 V. A comparison between the electrochemical behavior of dopamine and the electrochemical behavior of dopamine-quantum dots at the electrode surface showed the dopamine-quantum dots have more peak currents than dopamine. The effect of scan rate, pH and ascorbic acid on the electrode response was also studied.



Keywords: carbon quantum dots, dopamine, electrochemical

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PS137

Determination of kinetic parameters of tryptophan and glutathione with modified carbon paste electrode with nano zeolit

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ABSTRACT

The aim of this article, is simultaneous determination of Tryptophan (TRP) and Glutathione (GSH) using modified carbon paste electrode with nano zeolite. By investigating the behavior of optimal electrode in presence of two substances with different iron (II) percentage, irons doped nano-zeolit with respect to graphite (FeZSM-5/CPE) result in modified electrode with 30:70 nano zeolit to be selected as an optimal electrode. Electrochemical optimal electrode behavior was studied through using cyclic voltammetry in different scan rates, and the value (Γ*) of Glutathione and Tryptophan were 1.314×10^{-7} mol.cm^{-2} and 3.25×10^{-7} mol.cm $^{-2}$ respectively. Using the chronoamperometric technique, the behavior of GSH and TRP in different concentrations were calculated and the constant (K) were shown to be 1.96×10^{6} cm^{3}.mol^{-1}·s^{-1} and 1.27×10^{6} cm^{3}.mol^{-1}·s^{-1}.

Keywords: Modified electrode, Tryptophan, Glutathione, Cyclic voltammetry, Chronoamperometry

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PS138

Copper nanoclusters/silica nanoparticles composite modified carbon paste as an electrochemical sensor for the determination of dopamine in the presence of ascorbic acid

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ABSTRACT

Copper is widely used in industry because of its high conductivity, similar properties to gold and silver and much lower cost. However, compared to the extensive studies on gold and silver, reports on copper nanoclusters are still scarce primarily because of their susceptibility to oxidation and the difficulty in preparing extremely tiny particles[3]. Silica-based nanoparticles have been considered as interesting materials for electrode modification and bioelectroanalysis, and have been used especially effectively for immobilization of enzymes, proteins, DNA and polyphenol without affecting their biological activity [2,3].

Here we report on an electrochemical sensor based on modification of carbon paste electrode (CPE) by copper nanoclusters silica nanoparticles composite (CuNCs/SiO_2) was prepared for voltammetric determination of dopamine (DA) in the presence of ascorbic acid (AA). The electrochemical behaviors of dopamine on CuNCs/SiO_2/CPE were investigated by cyclic voltammetry (CV) and differential pulse voltammetry (DPV). DA was determined in the range of 10.0 – 900.0 µM, and the limit of detection was determined as 0.43 µM using DPV. The developed electrochemical sensor was further employed for the determination of dopamine in human blood plasma, with good recovery.

Keywords: Copper Nanoclusters, Silica nanoparticles, Carbon Paste electrode, Electrochemical Sensor

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PS139

Design and fabrication of non-enzymatic electrode in electrochemical glucose sensors based on ZnO/CNT nocomposites

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ABSTRACT

In this research, a new method are developed to measure and detect glucose amount in blood sample with designing and fabrication of new types of commercial, sensitive and high accurate non-enzymatic electrode based on ZnO/CNT nocamposite. At the first, carbon nanotubes array (CNTs) was coated by plasma-enhanced chemical vapor deposition (PECVD) on a polyaniline substrate, then zinc oxide (ZnO) nanoparticles were embedded on the CNTs array by ultrasound spraying. The morphology and structure analyze of ZnO/CNT nanocomposite were characterized by atomic force microscopy, scanning electron microscopy, X-ray diffraction, and Fourier transform infrared (FT-IR). The electro-catalytic activity of ZnO/CNT nanocomposite was investigated for detection and oxidation glucose under alkaline conditions (pH 6.5) using cyclic voltammetry (CV). The electrode exhibited a maximum power density at 116μw/s^2 under a fixed potential of 0.41V. The electrode also tested with human blood serum samples, and shoed that this type of electrode has a high electro-catalytic activity with %5 deviation than alkaline samples, good stability, fast response, suitable selectivity along with no interference common species in the blood, and repeatability. The experimental results of this study, indicate high capability and as well as low cost production electrode electrochemical based on ZnO/CNT nocamposites for fabrication and development of non-enzymatic glucose biosensors.

Keywords: Electrochemical biosensor, Non-enzymatic electrode, Glucose, Nocamposites

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PS140

Highly sensitive DNA biosensor based on ssDNA immobilization of on the surface of nickel oxide nanoparticles

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ABSTRACT

Rapid and simple determination of specific sequences DNA targets associated with either genetic or pathogenic diseases has become increasingly important in clinical and diagnostics fields [1-2]. In the present study a very sensitive electrochemical ssDNA assay based on ruthenium Complex (Ru-complex) and nickel hydroxide nanoparticles was developed. DNA molecules were attached to the surface of the nickel hydroxide modified glassy carbon electrode. DNA immobilization and hybridization were characterized by electrochemical impedance spectroscopy (EIS) and differential pulse voltammetry. The Ru-complex current response indicates only the complementary sequence showing an obvious current signal in comparison to non-complementary and r single point mismatched sequences. The fabricated biosensor possessed good selectivity and sensitivity for complementary probe, taxon: 32630 tumor necrosis factor (TNF). The linear dynamic range, sensitivity and detection limit of the proposed biosensor were 4×10^{-10} M to 1×10^{-8} M, 34.32 nAnM^{-1} and 6.8×10^{-11} M, respectively. Excellent reproducibility and stability, quite simple and inexpensive preparation are the other advantages of proposed biosensor.

Keywords: Modified electrode, DNA, Electrochemical, Biosensor.

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PS141

Electrochemical biosensor for simultaneous determination of serotonin, dopamine and ascorbic acid using a novel platform based on carbon nanofibers and Au nanowires

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ABSTRACT

Neurotransmitters, such as dopamine (3,4-dihydroxyphenylethylamine, DA) and serotonin (5-hydroxytryptamine, 5-HT) are chemicals in the brain that transmit signals from the neurons to the target cells. Simultaneous measurement of DA and 5-HT is particularly important since these molecules coexist typically and their relative levels have implications in many diseases and response to drug treatments. Ascorbic acid (AA) is a common interference that coexists with DA and 5-HT in the brain at concentrations 100–1000 times higher than that of them [1,2].

Hence, development of a sensitive electrochemical method for the simultaneous determination of AA, DA and 5-HT through a modified glassy carbon electrode with carbon nanofibers and gold nanowires was the core objective of this work [3]. The dependence of the oxidation peak currents on the pH of the solution, amount of modifier and concentration of the analytes was studied to optimize the experimental conditions. The sensor provided a good performance for the simultaneous determination these species in a mixture by not only greatly enhanced their current responses, but also resolved the overlapping peak potentials as well as decreased the overpotentials. Using differential pulse voltammetry, three distinct peaks were seen for the proposed sensor at 0.01, 0.18 and 0.35 V for the ternary mixture of AA, DA, and 5-HT (in 0.1 M PBS (pH 7.0)). The detection limits of AA, DA and 5-HT were 200 nM, 5 nM and 30 nM, respectively. This sensor exhibited excellent stability, sensitivity, selectivity, reproducibility and could be successfully applied for the determination of AA, DA and 5-HT in human cerebrospinal fluid, blood serum and plasma.

Keywords: Serotonin, Dopamine, Ascorbic acid, Carbon nanofibers, Au nanowires

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PS142

A novel electrochemical sensor for voltammetric determination of thiamphenicol residue in bovine milk

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ABSTRACT

Thiamphenicol (TAP) is a bacteriostatic antibiotic, active against both gram positive and gram negative pathogens and also effective against anaerobic organisms [1].This drug has been used for therapeutic purposes in veterinary [2]. However use of antibiotics such as TAP is vital to control illness, residue of TAP in bovine milk effects on human being [3]. As a result, the development of an on-line selective and sensitive monitoring system for determination of TAP in bovine milk needs to be given priority. So in this work a sensitive electroanalytical sensor was presented for the determination of TAP residue in bovine milk using screen printed electrode (SPE) modified with gold nanoparticles (AuNPs) and multi-walled carbon nanotubes (MWCNTs) which is inter-linked by ethylenediamine (en). The differential pulse voltammetry (DPV) response of the AuNPs/en-MWCNTs/SPE under optimized conditions was linear in the range of 0.1-30 μM with a limit of detection of 0.003 μM (S/N = 3). The repeatability of the proposed sensor towards determination of TAP (10 μM) was evaluated using the same fabricated electrode (n=5). The results had a relative standard deviation (RSD) of 3.57 %. Reproducibility of TAP sensor showed RSD of 2.11 % (n=6) for 10 μM of TAP. The stability of the fabricated sensor was evaluated on inter-day basis for a period of seven days. The results showed that the electrode retained 90 % of its initial signal for the determination of 10 μM TAP within seven days. In addition, the sensor was successfully employed for determining the TAP residue in bovine milk, and the results were in agreement with those using high performance liquid chromatography (HPLC) as the standard test method.

Keywords: MWCNTs, AuNPs, Ethylenediamine, Electrochemical sensor, Thiamphenicol

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PS143

Electrochemical determination of tert-butylhydroxyanisole using nanostructure sensor modified with MgO nanoparticle and ionic liquid

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ABSTRACT

Antioxidants are essential components for human body .Tert-butylhydroxyanisole (BHI) is useful antioxidant in food samples [1]. In this work *a high sensitive and convenient voltammetric sensor was* fabricated for the determination of BHI by using carbon paste electrode modified with MgO nanoparticle and ionic liquid (MgO/NPs/ILs/MCPE). At optimum condition in voltammetric analysis, MgO/NPs/ILs/MCPE showed good electrocatalytic activity. The plot of oxidation signal vs. concentration of sulfapyridine was linear in the range of 0.2 to 700.0 µM and detection limit was calculated to be 0.08 µM. MgO/NPs/ILs/MCPE The was also examined for the determination of BHI in real samples.

Keywords: Tert-butylhydroxyanisole, *MgO nanoparticle,* Voltammetric sensor

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PS144

Electrochemical DNA biosensor based on conducting polymer modified electrode for sensitive determination of biological compounds

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ABSTRACT

In recent years there has been an increase in the use of nucleic acids as a tool in the recognition and monitoring of many compounds by using DNA as a surface-modification element in electrochemical biosensors [1]. DNA is a stable, low-cost and easily adaptable molecule, being an excellent building block for the construction of new devices in nanotechnology and biosensor technology. A DNA-electrochemical biosensor is formed by immobilization of DNA (the biological recognition element) on the surface of electrochemical transducer and used to detect DNA-binding molecules (the analyte) that interact and induce changes in the DNA structure and electrochemical properties, which are further translated into an electrical signal [2]. Nowadays, various nanomaterials have been fabricated for increasing the sensing performance of electrochemical biosensors. Use of nanomaterials can increase the surface of the transducing area of the biosensors that in turn bring an increase in catalytic behaviors. Recently, the electropolymerization of amino acids on electrodes, in particular poly L-cysteine (PCys), has been used as a strategy for determining analytes. This polymeric films can enhance both selectivity and sensitivity, improve response time and exhibits good stability.

In this research, ds–DNA/PCys/GO–Fe_3O_4 modified carbon paste electrode (CPE) was designed for detection of guanine (G) and adenine (A). The direct electro–oxidation behaviors of G and A on the ds–DNA/PCys/GO–Fe_3O_4/CPE were carefully investigated by cyclic voltammetry and differential pulse voltammetry. All the measurements were done in citrate–phosphate buffer solution 0.1 M (pH 6.5) and the oxidation peak was observed at 0.70 and 1.10 V (*vs.* Ag/AgCl) respectively for G and A. The results indicated that both G and A showed the increase of the oxidation peak currents with the negative shift of the oxidation peak potentials in contrast to that on the bare CPE. Peak currents of G and A increased linearly with their concentrations in the ranges of 0.01–25 μM for both analytes. The estimated detection limit for G and A was 1.5 and 3.4 nM, respectively. The biosensor exhibited some advantages in terms of simplicity, rapidity, high sensitivity, good reproducibility and long–term stability. Furthermore, the measurements of thermally denatured single-stranded DNA were carried out and the value of (G + C)/(A + T) of DNA was calculated as 0.80.

Keywords: DNA biosensor, Guanine, Adenine, Nanomaterials, Electroanalytical method

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PS145

Developing an electrochemical sensor based on Ni (II) complex and graphene nano sheets modified electrode for determination of methanol and investigation of its behavior

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ABSTRACT

Methanol is produced naturally in the anaerobic metabolism of many varieties of bacteria and there is methanol in some fruits like grape [1]. Pure methanol, was first isolated in 1661 by Robert Boyle [2]. In the present research, the electrooxidation of methanol was investigated at a carbon paste electrode modified with Nickel (II) complex and graphene in an alkaline solution. Under optimum conditions, some kinetic parameters such as the rate constant and electron transfer coefficient were calculated to be 2.58 s^{-1} and 0.51, respectively .By using differential pulse voltammetry, two linear ranges were obtained for peak currents versus various concentration of methanol. The obtained linear ranges contain 10.0 -100.0 μM and 100.0-1000.0 μM, and the detection limit for determination of methanol was found to be 0.28 μM. The combination of graphene and Ni(II)-BS leads to a suitable method for determination of methanol which is applicable for real samples (an industrial ethanol solution).

Keywords: Methanol, Modifier, Electro oxidation, Graphene, Carbon paste electrode

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PS146

Amperometric sensor for tetracycline determination based on molecularly imprinted technique

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ABSTRACT

Tetracycline (TC), widely used broad spectrum antibiotic, is excreted to environment seriously [1].Because of its harmful effects, it is essential to establish an effective method for TC determination [2, 3]. This work reports the use of a tetracycline (TC) sensor constructed from molecularly imprinted polymer (MIP). The TC selective molecularly imprinted polymer (MIP) and non-imprinted polymer (NIP) were synthesized. The performance of the imprinted (MIP) and non-imprinted (NIP) polymer was evaluated by differential pulse voltammetry (DPV).The effect of pH, type of electrolyte and interferences on the performance of the MIP electrode was investigated and optimized. Under the optimum conditions the peak current was linear to the concentration of tetracycline in the range 1×10^{-5} –1×10^{-3} mol/L with a correlation coefficient of 0.9928 the detection limit and relative standard deviation (R.S.D%) were determined as 3.3×10^{-6} mol/L and 3.5% respectively.The sensor also displayed high selectivity and stability. It was applied to the determination of tetracycline in chicken meat and the recovery was 97–110% the proposed method is simple and quick. prepared sensor has a low response time, good mechanical stability and is simple to construct.

Keywords: Amperometric sensor, Tetracycline, Molecularly imprinted polymer

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PS147

A betamethasone-nanocomposite based electrochemical chiral nanosensor

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ABSTRACT

Because of the importance of chiral compounds, especially in the pharmaceutical industry, a number of methods such as crystallization, high performance liquid chromatography, electrophoresis, fluorescence and electrochemical techniques have been used for chiral analysis. But, developing an electrochemical sensor for chiral analysis has priority on other methods due to its simplicity, speed and low cost [1]. The goal of this study was to design and build a chiral electrochemical nanosensor based on a nanocomposite of betamethasone as a chiral selector for determination of mandelic acid enantiomers. Electrochemical deposition of this nanocomposite was done on glassy carbon electrode. A number of techniques such as cyclic voltammetry, differential pulse voltammetry, electrochemical impedance spectroscopy and scanning electron microscopy were used to characterize this film. Also, docking software was used to investigate the possible interactions between betamethasone and mandelic acid enantiomers. Due to the overlapping of the voltamograms obtained from this sensor, partial least squares method (PLS) was used for determination of mandelic acid enantiomers in the mixtures. Then for improvement the calibration model performance and its predictive ability, genetic algorithm was used to find the optimum potentials.

Keywords: Electrochemical nanosensor; Bethamethasone, Chemometrics methods

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PS148

Voltammetric determination of clonazepam using screen printed carbon electrodes modified with copper/porous silicon nanocomposite

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ABSTRACT

This paper describes a new sensitive and selective electrochemical sensor for determination of clonazepam (CLZ) based on a screen-printed carbon electrode (SPCE) modified with copper/porous silicon nanocomposite.The copper /porous silicon nanocomposite was synthesized by a simple in-situ redox reaction between $CuSO_4$ and PSi, in hydrofluoric acid solution[1,2]. Cyclic voltammetry and differential pulse voltammetry (DPV) methods were used for the electrochemical studies and measurements.The morphological properties of Cu/PSi nanocomposites was characterized by different spectroscopic and electrochemical techniques including scanning electron microscopy, X-ray diffraction, energy dispersive X-ray spectroscopy, Fourier transform infrared spectroscopy. Several significant parameters controlling the performance of the sensor were examined and optimized. Under the optimized condition calibration curve of the Cu/PSi sensor was linear in the concentration range of 0.4–1000 µM, and the detection limit was 0.1 µM. The obtained results show that the Cu/PSi exhibits high electrocatalytic activity toward the reduction of CZP. The screen printed sensor has the advantages of high porous surface structure, ease of preparation, good reproducibility and repeatability, high selectivity and sensitivity. Furthermore, the proposed method was successfully intended for the determination of clonazepam in real samples (tablet, plasma).

Keywords: Nanocomposite**,** Porous silicon**,** Clonazepam detection**,** Modified screen printed electrode

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PS149

Coupling of microextraction and voltammetry techniques for the determination of ascorbic acid using a magnetic ionic liquid

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ABSTRACT

Vitamin C, also known as ascorbic acid (AA), is a vitamin found in foods and used as a dietary supplement. AA is a necessary and water-soluble vitamin essential in the human nutrition, with a recommended of daily intake of about 70 mg. So, determination of ascorbic acid concentration is of importance [1]. Magnetic ionic liquids (MILs) are a subclass of ILs that contain either magnetic cations or magnetic anions [2,3]. Single-drop microextraction (SDME) is a very simple method for micro-scale sample cleanup and pre-concentration [4]. In the present work, an ammonium-based magnetic ionic liquid containing $MnCl_2^{2-}$ as anion was synthesized and used for the extraction of ascorbic acid. Ascorbic acid was extracted into the ionic liquid after interaction with the anion of the ionic liquid. Voltammetric determination followed the extraction process. For this purpose, the IL-rich phase separated from the aqueous sample using a magnet, was placed on the surface of a carbon nano-titan paste electrode. In this way, the IL was used as both extracting solvent and electrode modifying agent. The peak current obtained from the electrochemical oxidation of ascorbic acid was used as the analytical signal correlated to the concentration of ascorbic acid. Different experimental parameters affecting both the extraction and electrochemical processes were optimized. Under the optimized conditions, a linear concentration range of 1.50-40.0 µM with a detection limit of 0.43 µM was obtained. The presented approach was successfully applied to the determination of ascorbic acid in effervescent tablets of vitamin C and orange juice samples. The obtained results indicated applicability of the designed method to complex media.

Keywords: Ascorbic acid, Magnetic ionic liquid, Microextraction, Voltammetry

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PS150

Voltammetric Determination of an Azo dye in Textile sewage using Carbon Paste Electrode modified with multi-walled carbon nano tubes

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ABSTRACT

The textile effluents including dyes, detergents, acids, organic compounds and heavy metals are a worldwide problem for the environmental protection [1,2]. Azo dyes accounts for the majority (more than 3000 different varieties) of all textile dyestuffs produced because of the ease and cost effectiveness of their synthesis, their stability and the variety of colors available compared to natural dyes [3]. Therefore development the methods for determination of azo dyes in textile sewage is important.

In the current work a carbon paste electrode modified with multi-walled carbon nano-tubes (MWCNT-CPE) was fabricated and used for sensitive and convenient electrochemical determination of an azo dye, Direct Red 80 (DR80) in 0.1 M phosphate buffer (PSB) at pH 3.0 by cyclic voltammetry (CV) and differential pulse voltammetry (DPV) techniques. Experimental parameters, such as pH, scan rate, accumulation time and amount of multi-walled carbon nanotube were optimized. All the voltametric measurements were carried out using an Autolab potentiostat/galvanostat PGSTAT 30 equipped with a three electrode system that used a carbon paste working electrode, an Ag/AgCl and a Pt wire as the reference and counter electrode, respectively.

Under the optimized experimental conditions, a well defined oxidation peak was observed and the peak current increased linearly with the DR80 concentration within the concentration range of 0.1 to 200.0 μM using DPV with a detection limits (S/N > 3) of 50 nM. The effect of foreign spices on the electrochemical determination of DR80 was studied and the tolerance levels were obtained. Finally, this modified electrode was applied to the voltammetric determination of DR80 in sewage of several textile companies and Caspian Sea. Good sensitivity and selectivity were achieved by DPV experiments with MWCNT-CPE with a low detection limit.

Keywords: Textile sewage, Electrochemical determination, Direct Red 80, Modified electrode

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PS151

Construction of an electrochemical sensor based on a carbon paste electrode modified with a hydroquinone derivative and titanium oxide nano particles for determination of hydroxyl amine: Simultaneous determination of hydroxyl amine and Phenol

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ABSTRACT

Hydroxylamine (HA) as a reducing agent is a natural product which is found in mammalian cells and bacteria. HA is a famous mutagen, which makes specific mutations with the nucleic acid cytosine [1]. Moderate levels of hydroxylamine can be toxic to humans, animals and plants [2, 3]. The present paper reports using a hydroquinone derivative and nano particle of TiO_2 in the carbon pate electrode (CPE) structure as an electrochemical sensor for HA determination. The electrocatalytic reduction of HA was investigated using various electrochemical techniques. The kinetic parameters of modifier contain of electron transfer coefficient (α) and heterogeneous rate constant (k) for hydroxyl amine were obtained. Under the optimum conditions, the differential pulse voltammograms of hydroxyl amine indicated a good linear range of 0.032 to 10 mM and low detection limit of 4.09×10^{-3} mM (based on 3Sb/m) for determination of HA. The designed sensor (TiO_2/CDHIT/CPE) was used for simultaneous determination of hydroxyl amine and phenol. Also, the TiO_2/CIT/CPE sensor was successfully applied for the assay of hydroxyl amine in real samples (water samples).

Keywords: *Hydroxyl amine; Phenol; Titanium oxide nano particles; Modifier; Electrochemical sensor*

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PS152

Electrochemical behavior and voltammetric determination of risperidone at the functionalized multi-walled carbon nanotubes modified glassy carbon electrode

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ABSTRACT

Risperidone (Ris), 3{2-[4-(6-fluoro-1,2-benzisoxazol-3-yl)piperidin-1-yl]ethyl}-2-methyl-6,7,8,9-tetrahydro-4H-pyrido(1,2-a)pyrimidin-4-one, is a typical antipsychotic drug which is mainly used to treat schizophrenia, bipolar disorder, and irritability in people with autism.It has high affinity for D2 dopaminergic receptors [1] .In the recent years, carbon–based nanomaterials have attracted enormous interests due to their excellent electrical, chemical and mechanical properties, which make them suitable for developing nano-electronics and electrochemical sensors [2]. In this work, various modified electrodes were prepared by casting different carbon nanomaterials including functionalized multi-walled carbon nanotubes (f-MWCNTs), carbon nanoparticles (CNPs), nanodiamond/graphite mixture (NDG) and reduced graphene oxide (RGO) on the surface of the glassy carbon electrode. Cyclic voltammetry (CV) was used to study the electrochemical behavior of Ris on the surface of the prepared modified electrodes. In comparison to other carbon nanomaterials, f-MWNTs modified electrode shows higher improvement in electrochemical response toward Ris. The modified electrode exhibits excellent electrocatalytic activity towards the oxidation of Ris .The dependence of the oxidation peak current at pH of the solution, amount of the casted modifier, and the scan rate were studied to optimize the experimental conditions. A detection limit of 0.012 µM and a linear dynamic range of 0.04–7 µM were obtained for Ris determination using f-MWNTs/GCE. The results proved the efficiency of the fabricated modified electrode for simple, low cost and highly sensitive medicine sensor well suited for the accurate determination of trace amounts of risperidone in the pharmaceutical and clinical preparations.

Keywords*:* Carbon nanotubes, Risperidone, Schizophrenia , Cyclic voltammetry.

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PS153

Covalent functionalization of carbon nanotubes with safranin O for electrocatalytic determination of nitric oxide

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ABSTRACT

In this research, we have demonstrated *that* safranin O (SFO) can be coupled to acid-treated multiwalled carbon nanotubes (MWNTs) in the presence of 1-ethyl-3-(3-dimethylaminopropyl)-carbodiimide (EDC) and N-hydroxysuccinimide (NHS) and assembled as SFO-MWNT composites. These functionalized MWNTs can be used for modification of glassy carbon electrode and applied for electrocatalytic determination of nitric oxide.

A glassy carbon electrode modified with safranin O and carbon nanotubes have been applied to the electrocatalytic reduction of nitric oxide. The results indicate that the carbon nanotube and safranin o system can enhance electrocatalytic activity toward the reduction of nitric oxide. Under the optimized conditions, in potassium hydrogen phthalate buffer solution 0.1M of pH 1, the reduction current increased linearly in the range of 0.08-2.10mM and detection limit was 0.05mM. The proposed method was applied to the determination of nitric oxide in real samples.

Keywords: Safranin O, Carbon nanotubes, Functionalization, Electrocatalysis.

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PS154

A novel sensor based on electro-polymerization molecular imprinted polymer on gold electrode for determination of methamphetamine by voltammetry method

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ABSTRACT

For the first time, a new selective and sensitive Voltammetry sensor was fabricated based on electro-polymerization of molecularly imprinted polymer (MIP). The surface of gold electrode was modified with 4-Aminothiophenol monomer by self-assemble monolayer (SAM). Then MIP is formed at the gold electrode surface was modified by electro-polymerization of Di phenyl amine and silver nanoparticle in the presence of Methamphetamine as the template molecule. The extraction of the template molecule leads to formation of cavities. The performance of electrochemical sensor was investigated by DPV in the presence of $Fe^{+3/+2}$ solution as redox probe. Under the optimized condition, the electrochemical sensor was obtained a linear range from 0.18 – 1.8 mg L^{-1} and a detection limit of 0.066 mg L^{-1}. The proposed method was successfully applied to determination of Methamphetamine in urine sample.

Keywords: MIP, Methamphetamine, Self-assemble, 4-Aminothiophenol, Di phenyl amine

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PS155

Functionalized titanium dioxide nanoparticles modified glassy carbon electrode for sensitive and selective determination of epinephrine in the real samples

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ABSTRACT

Today, nanomaterials have been widely used in various fields such as sensors, biosensors, industrial, medical and etc. Among these nanomaterials, titanium dioxide nanoparticles are important because of their unique physic-chemical properties (high photosensitivity, being non-toxic, easy availability, strong oxidation power and high stability). Titanium dioxide nanoparticles (TiO_2 nanoparticles) was utilized as an ideal photocatalyst to measure of photocatalytic performance. In this study, nanoparticles of titanium dioxide prepared with sol-gel method that is a simple and easy way at room temperature and atmospheric pressure and functionalized electrocatalytically to improve its performance. The morphology of TiO_2 nanoparticles was investigated by scanning electron microscopy (SEM) and transmission electron microscopy tunnel (TEM). The catalyst was used to study on the electrochemical behavior of epinephrine (EPI) in the presence of other biological species. The results show that the electrochemical behavior of epinephrine is corresponded to the parameters such as pH, concentration of EPI, catalyst concentration and potential scan rate. The electrochemical techniques such as cyclic voltammetry and chronoamperometry were applied to calculate parameters such as transfer coefficient, α (0.6) and diffusion coefficient, D (1.63×10^{-6} $cm^2.s^{-1}$). The functionalized titanium dioxide nanoparticles modified glassy carbon electrode was used for the determination of EPI in the real samples.

Keywords: Titanium dioxide nanoparticles, Cyclic voltammetry, Epinephrine, Differential pulse voltammetry

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PS156

Simultaneous voltammetric measurement of hydroquinone and catechol at a glassy carbon electrode modified with erio chrome black T

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ABSTRACT

In an effort to develop a voltammetric method for the simultaneous, selective and sensitive determination of hydroquinone and catechol, erio chrome black T was used as a modifier for modification of glassy carbon electrode. A novel voltammetric sensor was developed based on glassy carbon electrode. The resulting electrode was applied for simultaneous determination of Hydroquinone and catechol. The surface morphology and property of the modified electrode were characterized by scanning electron microscopy and electrochemical. Bare GCE fails to resolve the voltammetric signals of HQ and CC in a mixture. However, the modified electrode not only separates the voltammetric signals of HQ and CC, but also shows higher oxidation current for these molecules (figure 1). CV and DPV results showed that the isomers can be detected selectively and sensitively at this modified glassy carbon electrode with peak-to-peak separation about 87 mV. Under the optimized conditions, the peak currents possess a linear relationship with the concentration of analyte in the range of 1- 100 µM and the detection limit is 0.3µM (S/N = 3). The present electrode was applied to the simultaneous determination of HQ and CC in rai, tap and river water samples. The kinefic parameters such as charge transfer coefficient (α) and the number of elecrons involved in the rate determinating step (n_α) were calculated.

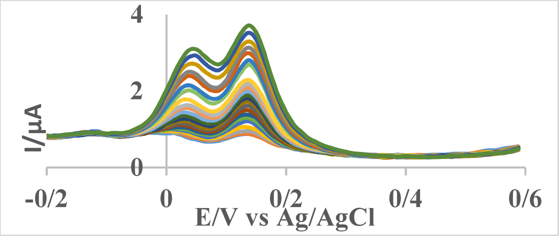

Figure 1. DPV voltamograms of hydroquinone and catechol at modified electrode

Keywords: Hydroquinone, Catechol, Eriochrome black T, Glassy carbon electrode.

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PS157

Electrochemical determination of pyrazinamide at silver nanodendrites supported on layered double hydroxides modified electrode

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ABSTRACT

Pyrazinamide (PZA) also called as pyrazinecarboxamide is a first-line oral drug used to treat tuberculosis (TB) caused by mycobacterium tuberculosis [1]. Development of sensitive and selective method for determination of PZA in body fluids is more important for the therapeutic dosage and monitoring of toxicity levels. In recent years drug sensors have been playing an immense role in electrochemical studies and different kind of drug sensor papers has been reported [2]. In this work, The Ag nanodendrites (AgNDs) were directly electrodeposited on the surface of layered double hydroxides (LDH) modified glassy carbon electrode via potentiostatic method without using any templates, surfactants, or stabilizers. LDH nanoparticles were prepared by coprecipitation and subsequent hydrothermal treatment method. The as-synthesized nano-structured materials were characterized by scanning electron microscopy (SEM), energy dispersive X-ray (EDX) analysis, X-ray diffraction (XRD) and Fourier transform IR (FT–IR). The AgNDs/LDH modified glassy carbon electrode exhibited good electrocatalytic activity toward the reduction of pyrazinamide. The electrochemical behavior of PZA on the AgNDs/LDH/GCE was investigated in detail. Under the optimal experimental conditions, the current response of the fabricated sensor obtained via differential pulse voltammetry was increased linearly with PZA concentrations in the wide range from 0.9 to 520 µM. The proposed sensor was applied to determination of PZA in pharmaceutical formulation and biological fluids with satisfactory results. The proposed sensor displayed good selectivity, repeatability and good reproducibility.

Keywords: Layered double hydroxide, Ag nanodendrites, Pyrazinamide, Differential pulse voltammetery

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PS158

Simultaneous determination of textile dyes in wastewater using RuO_2/reduced graphene oxide-multi walled carbon nanotubes modified glassy carbon electrode

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ABSTRACT

Azo and anthraquinone are the major commercial dyes. Acid blue 29 (AB 29) belongs to the azo dyes and acid blue 40 (AB 40) belongs to the anthraquinone class and represents second most important class of commercial dyes after azo dyes. In modern industries, these dyes widely used in textile manufacture, leather processing and paper printing [1,2]. Their increase in the surroundings poses potential risks on the eco-environment and human health due to their toxicity, mutagenic and carcinogenic nature [3]. A novel simultaneous electrochemical sensor based on RuO_2/reduced graphene oxide-multi wall carbon nanotubes (RuO_2/rGO-MWCNTs) modified glassy carbon electrode was developed for simultaneous determination of acid blue 40 (AB 40) and acid blue 29 (AB 29). The properties of several parameters on the sensitivity for determination of both species were investigated. The electrochemical behavior of AB 40 and AB 29 were investigated using square wave voltammetry and the results indicate that the electrochemical responses are improved significantly at the modified electrode. Under the optimized situation, a linear dynamic range for AB 40 and AB 29 of 0.10-45.00 µM and 0.80-75.00 µM with the detection limits of 0.06 µM and 0.65 µM were obtained, respectively.

Keywords Simultaneous determination, Acid blue 40, Acid blue 29, reduced graphene oxide, Multiwalled carbon nanotubes.

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PS159

Electrochemical determination of sulfapyridine in pharmaceutical samples using CuO/CNTs polypyrrole pencil graphite electrode as a sensor

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ABSTRACT

Sulfapyridine is a sulfonamide antibacterial and used for treatment of infections in humans [1]. In this work, an electrochemical modified nanostructure sensor was fabricated for voltammetric analysis of sulfapyridine in aqueous solution. For this goal, we fabricated a pencil graphite electrode modified with CuO/CNTs and polypyrrole (CuO/CNTs/PP/PGE) as a highly sensitive sensor. At optimum condition in voltammetric analysis, CuO/CNTs/PP/PGE showed good electrocatalytic activity. The plot of oxidation signal *vs.* concentration of sulfapyridine was linear in the range of 0.08 to 500.0 µM and detection limit was calculated to be 0.04 µM. The CuO/CNTs/PP/PGE was also examined for the determination of sulfapyridine in real samples and recovery value between 97.0-104.0% were obtained for analysis of this drug. The RSD% for 10 replicates determination of 20.0 µM and 30.0 µM of sulfapyridine were 1.7% and 2.5%, respectively

Keywords: Sulfapyridine, CuO/CNTs, Polypyrrole

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PS160

Voltammetric determination of Sn(II) using a zeolite nanoparticles - modified carbon paste electrode

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ABSTRACT

To improve figures of merits of electrochemical techniques modification of electrode surfaces with suitable modifiers such as zeolites have been widely done. Due to unique properties of zeolites including high cation exchange capacity (CEC), excellent selectivity to charge, size and shape of cationic species, high chemical, thermal and mechanical stability, these compounds have been used for modification of electrode surface in potentiometric and voltammetric methods. Ion exchange permits to use zeolite modified electrodes (ZMEs) in indirect determination of different organic and inorganic compounds [1,2]. A novel, simple, cheap and very sensitive modified carbon paste electrode (CPE) was used for indirect determination of tin in aqueous solution. In this work, Fe (II)-exchanged clinoptilolite nanoparticles was used for the modification of CPE. Peak current of Fe (II) redox system exited form Fe (II)-exchanged clinoptilolite nanoparticles modifier (Fe (II)-NClin) at the surface of CPE was increased in the presence of tin (II). Hence, this increase in peak current was used for indirect determination of tin. Raw and modified zeolite and CPE were characterized by XRD, FT-IR, SEM-EDX and X-ray mapping techniques. To study the effects of more influencing experimental variables (such as modifier%, amount of Fe(II), solution pH and potential scan rate experimental design was applied by response surface methodology (RSM). Under optimum conditions, the current response of Fe (II)-NClin/CPE was inversely proportional to Sn (II) in the concentration range from 1×10^{-8}-1×10^{-3} mol L^{-1} with a DL of 9.5×10^{-8} mol L^{-1}.

Keywords*:* Response surface methodology, Nanoparticles, Carbon paste electrode

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PS161

Graphene quantum dot-chitosan/methylene blue modified glassy carbon electrode for the non-enzymatic hydrogen peroxide sensing

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ABSTRACT

In this work, graphene quantum dots (GQDs) functionalized by chitosan (GQDs-CS) were used as a suitable support for immobilization of methylene blue (MB) by amino-hydroxyl reaction to fabricate a novel non-enzymatic H_2O_2 sensor onto a glassy carbon electrode (GCE). The synthesized nanocomposite was characterized by X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), cyclic voltammetry, FT-IR, UV–vis and photoluminescence (PL) spectroscopy, energy dispersive X-ray spectroscopy (EDX) techniques. Cyclic voltammetry experiments demonstrated that the GQDs-CS/MB/GCE exhibited a significant electrocatalytic activity for the reduction of H_2O_2. The calculated k_{cat} is 4.45×10^4 $cm^3mol^{-1}s^{-1}$. The calibration graph for H_2O_2 constructed by amperometry (-0.6 V vs. SCE) at the GQDs-CS/MB/GCE showed two different linear ranges (1.0×10^{-6}–2.9×10^{-3} M and 2.9–11.78 mM) with a sensitivity of 10.115 μA/mM for the lower linear range and a calculated LOD of 0.7 μM (S/N = 3). The response time of the sensor for H_2O_2 detection was 3s. The GQDs-CS/MB/GCE is not influenced by potential interferents (ascorbic and uric acids, dopamine, caffeine, glucose, and various inorganic salts) and can be used a san excellent electrocatalyst for a non-enzymatic H_2O_2 sensing in the food and water samples, due to its simplicity, low detection potential, low detection limit, high sensitivity, fast response and good selectivity and stability.

Keywords: Graphene quantum dots (GQDs), Methylene blue (MB), Chitosan (CS), Non-enzymatic sensor, Hydrogen peroxide (H_2O_2)

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PS162

Electrocatalytic degradation of malachite green dye in aqueous solutions using electrodeposited nanostructured lead dioxide on stainless steel substrate

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ABSTRACT

Electrocatalytic oxidation is a promising process for degradation of toxic and biorefractory organic pollutants in wastewater treatment. Selection of electrode materials is crucial for electrocatalytic degradation process [1, 2]. The development of PbO_2 anodes for the degradation and oxidation of organics has been gained great interest in environmental applications because of their good conductivity and large over-potential for oxygen evolution in acidic media, which enabling the production of hydroxyl radicals during water discharge [3, 4]. This work has investigated the electrocatalytic degradation of malachite green (MG) dye in aqueous solution with stainless steel/PbO_2 electrode. The novel PbO_2 electrode presented high stability, safety, oxygen evolution over potential and degradation efficiency for organic pollutants [5]. The surface morphology and crystal structure of the electrodes were characterized by scanning electronic microscopy (SEM) and X-ray difraction (XRD) respectively. Besides, the optimal degradation conditions were obtained by studying the effecting of different parameters, such as current densities (2-10 mA cm^{-2}), electrolysis time (1-50 min), initial pH (2-12) and initial MG concentrations (360-720 mgL^{-1}). The results of these factors are expressed in term of the remaining organic compounds concentrations (color removal) and chemical oxygen demand (COD removal). The results indicated that the color removal rates of MG reached up to 99% and COD removal up to 95% after 40 min electrolysis at initial 360 mg L^{-1} MG dye at constant current density of 10 mA cm^{-2} and energy consumption of 1.25 KWh Kg^{-1} COD, respectively. In addition, cyclic voltammetry tests showed that the degradation of MG was mainly achieved via indirect electrocatalytic oxidation mediated by hydroxyl radical.

Keywords: Electrocatalytic degradation, Electrodeposition, Nanostructure, Lead dioxide electrode, Malachite green.

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PS163

Electrocatalyitic oxidation of urea in alkaline medium by modified carbon paste electrode with Ni(II)-clinoptilolite nanoparticles

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ABSTRACT

Construction of novel electrodes for fuel cells is widely followed by researchers in recent decades [1,2]. In this work, a novel electrode isdeveloped for the electrocatalytic oxidation of urea in alkaline medium by modified carbon paste electrode with clinoptilolite nanoparticles ion-exchanged with Ni(II) cations. Designing the experiments was performed by response surface methodology (RSM). Oxidation of urea at the modified electrode occurs at a potential about 560 mV less positive than Pt electrodes. Surface coverage concentration of the electrode was calculated to be 3.97×10^{-6} mol.cm^{-2}. Apparent charge transfer rate constant the modified electrode wasobtained as 0.39 s^{-1} in the absence of urea. Electrocatalytic study of the modified electrode for urea oxidation was investigated with chronoamperometry and the catalytic rate constant (k) was estimated about 103 M^{-1}s^{-1}. The value of diffusion coefficient of urea was found to be 3.22×10^{-4} cm^{2}s^{-1}. The results showed that the proposed modified electrode can enhance the oxidation of urea by a catalytic process through decreasing of overpotential and increasing the current of urea oxidation with respect to unmodified carbon paste electrode.

Keywords: Urea oxidation, Modified electrodes, Response surface methodology, Clinoptilolite.

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PS164

Synthesis of nanopore ZSM-5 hierarchical zeolite from bagasse and its application for electrocatalytic determination of H_2O_2 using silver incorporated zeolite

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ABSTRACT

Nano-pore ZSM-5 hierarchical zeolite was synthesized based on silica nanowires extracted from bagasse (BGA). BGA is grown in the south of the Caspian Sea (Iran). This zeolite was utilized as good support for incorporating silver species in fabrication of amperometric sensor (Ag/ZSM-5/CPE) to measure hydrogen peroxide (H_2O_2). Prepared zeolite is characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared (FT-IR) spectroscopy, N_2 adsorption and desorption and energy dispersive X-ray (EDX) Techniques. Cyclic voltammetry (CV) studies exhibit that the sensor can increase the reduction current of H_2O_2. Amperometric response of sensor displays linear relationship the for H_2O_2 in range of 0.03-14 mM with a good response time of 3 s, high sensitivity of 71 $\mu A\ mM^{-1}$ and the detection limit 2.5 µM. Sensor do not affected by the interference of interfering species present in the biological samples. Capability of the prepared sensor (Ag/ZSM-5/CPE) in real sample practical analysis is studied.

Key words: Bagasse, Nano-pore hierarchical ZSM-5 zeolite, Hydrogen peroxide, Modified electrode

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PS165

The development of new electrochemical biosensor for the detection of alpha 1-antitrypsin in biological sample

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ABSTRACT

Alpha-1 Antitrypsin or α1-antitrypsin (A1AT) is a protease inhibitor. It protects tissues from inflammatory cells enzymes and has a reference range in blood of 1.5 - 3.5 gram/liter. Deficiency of alpha 1-antitrypsin is a genetic disease(mutation in AAT sequence) and leads to a chronic uninhibited tissue breakdown and causes the degradation especially of lung tissue, The level of A1AT in serum is most often determined by antibody and turbidimetry. Other detection methods include use of enzyme-linked-immuno-sorbent-assays and radial immunodiffusion, protein electrophoresis is imprecise, DNA biosensors. I this study we used A1AT antibody on carbon paste electrode as recognition layer and Electrochemical Impedance Spectroscopy for signal collection device. The increasing of charge transfer resistance was collected as biosensor signal. By optimizing the type of antibody, pH, time, buffer, blocking agent and concentrations we reached nM as detection limit.

Keywords: Alpha-1 Antitrypsin, Electrochemical biosensors, Carbon paste electrode, Electrochemical Impedance spectroscopy.

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PS166

Synthesis of Si@MOF nanocomposites as anode materials for lithium-ion batteries

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ABSTRACT

Silicon is new anode active material for lithium ion battery with high specific theoretical capacity 3600 mAh/g . But due to the volume change of 300% during lithiation insertion and extraction, after several charge and discharge cycles shows a sharp decrease in capacity and reversibility. So find a way to maintain the capacity of silicon anodes, is considered by many research groups The use of silicon nanostructures such as nanowires, nanotubes and protective layers made of polymer, metal oxides and carbon tissues, are methods that have been used until now

In this reserch, monodisperse porous silicon nanospheres (MPSSs) are synthesized via a simple and scalable hydrolysis process with subsequent surface-protected magnesiothermic reduction. To fully extract the real performance of the nano silicon, we use a controlled encapsulation strategy that enables surfactant-capped nanosilicon to be enshrouded by metal organice framework ZIF-8 and MOF-5. After simple pyrolysis Cage-like texture porous carbon, were formed around the nanoparticles. Scanning microscopy, X-ray powder diffraction, Raman spectra and N2 adsorption/desorption isoterm were employed to characterize the nano-Si/C nanocomposites. the thus-obtained composite shows exceptional electrochemical properties with a lithium storage capacity up to 1200 mA h g^{-1}, excellent cycle stability (>99% capacity retention after 50 cycles) and outstanding rate performance. These characteristics, combined with their high stability and ease of fabrication, make such Si@MOFnanocomposites ideal alternative candidates as high-energy anode materials in lithium-ion batteries.

Keywords: Lithium ion battery, Porous silicon nanospheres, ZIF-8, MOF-5

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PS167

Fabrication of screen printed sensor for investigating the electrocatalytic effect of nickel hexacyanoferate on cystein

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ABSTRACT

Screen printed electrode based sensors are miniature systems capable of analyzing real samples in natural and laboratory environments using biological tools [1-2]. Therefore, disposable sensors have advantages such as low cost, compatibility, portability and being in miniature scale. In this work, first, the inks required for the fabrication of conductive layer for the screep printed electrode was prepared. First, silver ink was prepared for which silver nanoparticles were synthesized and then by using the synthesized silver nanoparticles, silver epoxy resine composite was prepared and the prepared composite was spraid on the three-electrode template which was attached onto a flexible polyethylene terphetalate (PET) substrate which resulted in the formation of a resistant conductive layer 3 (Ω/cm) [3]. 4 mg nickel hexacyanoferate precipitate was weighted and potassium nicjel hexacyanoferate was added into epoxy resine and and graphite composite which resulted in the preoaration of an ink which was then spraid on the screep printed working electrode and the prepared electride was used for the investigation of the electrocatalytic effect of nickel hexacyanoferate on the oxidation of cystein. Also for covering the surface of the auxiliary electrode epoxy resine graphite composite was used which gave a conductive layer with the resistance of 70 (Ω/cm). The linear range of this electrode was from 3×10^{-4} M to 2.5×10^{-5} M and its limit of detection was 3.84×10^{-6} .

Keywords: Cystein, Screen printed electrode, Synthesized silver nanoparticles, Nickel hexacyanoferate

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PS168

Corrosion inhibition of mild steel in acidic solution by metoprolol tablet as a green inhibitor

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ABSTRACT

The inhibition effect of **metoprolol** tablet as corrosion inhibitor for mild steel in 0.5 mol L−1 sulphuric acid solution was investigated using potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) techniques. The results optained from *Polarization curves indicated that addition of* ***metoprolol*** to the sulphuric acid solution leads to decrease in corrosion current density. So on the corrosion current density in absence of this compound is1823.4µA and in the presence of that is 442.02µA. The inhibition efficiency was found to increase with increasing inhibitor concentration up to a certain value. The inhibition efficiency in the presence of goes to %۷۵for optimum concentration (300 ppm). The EIS measurements showed that by addition of the inhibitor up to a certain concentration, the charge transfer resistance increases and the double layer capacitance decreases. For optimum concentration the charge transfer resistance is 51.8Ω*The results* obtained from analysis of EIS data was in good agreement with those achieved by the polarization measurements.

Keywords: Potentiodynamic polarization, Electrochemical impedance spectroscopy, Green inhibitor, sulphuric acid

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PS169

A green approach for the electrosynthesis of new sulfonamide derivatives using 4,4′-diaminodiphenyl ether

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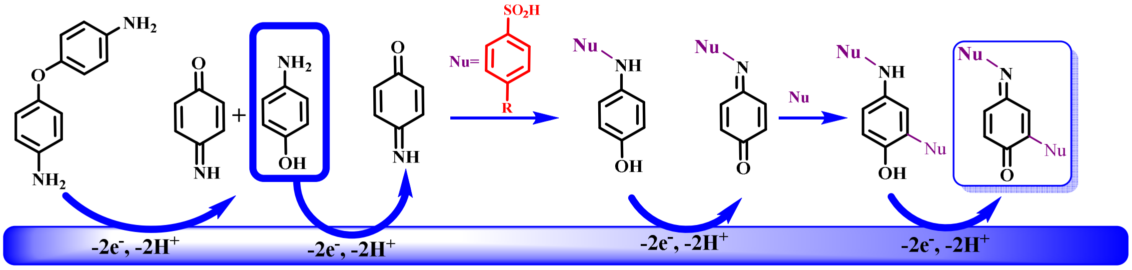
ABSTRACT

A green/sustainable synthesis is much more important than conventional synthetic methods. The concept and significance of green sustainable chemistry (GSC), has been recognized throughout the world, and nowadays new processes cannot be developed without consideration of GSC. In recent years, much attention has been paid to electroorganic synthesis as a typical environmentally friendly process[1,2]. Furthermore, sulfone compounds and sulfonamide derivatives are found in a wide variety of antibiotic drugs. These compounds have an effective inhibitory effect against the bacteria and antimicrobials effect against the wide range of human pathogens[3]. These advances and the importance of sulfonamides has promoted us to synthesize a number of these compounds. In this work, electrochemical oxidation of 4,4′-diaminodiphenyl ether in the presence of arylsulfinic acids have been studied using cyclic voltammetry and constant current coulometry. The results show that 4,4′-diaminodiphenyl ether is oxidized to its corresponding quinone-imine. The formed quinone-imines are then attacked by arylsulfinic acids. Two successive additions of the arylsulfinic acids give the final products in good yield and high purity (scheme1).



scheme1

Keywords: Electrochemical synthesis, Sulfonamide, 4,4′-Diaminodiphenyl, Galvanostatic method

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PS201

Fabrication of gradient nanostructure of ZnO using bipolar electrochemistry

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ABSTRACT

Bipolar electrochemistry is a simple and inexpensive method for fabrication of gradient surfaces. In this method, a gradient potential is made between the solution and the bipolar electrode by applying a constant potential to the feeder electrode. This gradient potential will cause different structures to be made through the bipolar electrode and a structural gradient across the surface of bipolar electrode.

In the first part of this study, a gradient nanostructure of zinc oxides is created at a copper substrate (bipolar electrode). The effect of various factors such as the applied potential, the duration of deposition, the concentration of zinc sulfate, various salts of zinc, supporting electrolyte and presence of eosin y on gradient structure are stuidied.The morphology and elemental composition of as-fabricated structures are studied using FESEM and EDX.

Finally, self-assembled adsorption process of 1-dodecanethiol is used for reduction of the surface energy and creating a surface with hydrophobicity. After surface modification with 1-dodecanethiol, a gradient of hydrophobicity is achieved at the surface of as-fabricated structures. The gradient hydrophobicity is confimed by measuring the contact angle of water droplet.

Keywords*:* Bipolar electrochemistry, Gradient nanostructur, Zinc oxide, Hydrophobic gradient

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PS202

Electrosynthesis of polypyrrol polymer as a sorbent in stirbar sorptive extraction procedure

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ABSTRACT

Solid phase micro extraction (SPME) is one of the most common procedures for enrichment of different analytes; Stirbar Sorptive Extraction (SBSE) is an important branch of SPME. In this work, fabrication of this sorbent is presented by electrosynthesis of Polypyrrol with Cyclic Voltametry (CV) for the first time. For this purpose, the electrosynthesis took place in the presence of pyrrol monomers and sodium dodecyl sulphate (SDS) as the counter ion in aquoues solution of Oxalic acid 0.4 M in a three electrodes system consisting a stainless steel rod with 1.5 mm×1.5 cm diameters, modified by OH- functional group as the working electrode, steel rod counter electrode and the Ag/AgCl refrence electrode. The optimized conditions of electrosynthesis achieved to be: 40 cycles of CV, slew rate of 10 mV/S and Pyrrol monomer: SDS concentration ratio of 1:1. Characterization of the produced sorbent was confirmed by FT-IR, scanning electron microscope (SEM) imaging and Energy-dispersive X-ray spectroscopy (EDXA). Afterwards, the stirbar was conditioned in water, methanol, and acetonitrile in order to remove any remained reactants from its porous structure. Evantually, the Polypyrrol covered stirbar was used to extract Naphthalene from water samples.

Keywords: Electrosynthesis, Stirbar sorptive extraction, Cyclic voltametry

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PS203

Electrochemical study of captopril on glassy carbon electrode modified by Molecularly imprinted polymer

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ABSTRACT

The technology of molecular imprinting is a viable synthetic approach to developed polymers with high selectivity and affinity for the target materials able to mimic natural recognition entities[1]. The use of molecularly imprinted polymers (MIP) has received much attention, due to its inherent advantages, such as the low cost of synthesis, high mechanical and chemical stability, as well as a highly selective recognition. MIP as a nano-spherical material, has a better performance for selective removal of trace of analytes from complex samples because of its small particle size and high specific surface area which could lead to a large amount of adsorption capacity and a fast adsorption rate [2]. Captopril is a specific inhibitor of the angiotensin converting enzyme which is widely used in the treatment of hypertension [3].

In this work, we will present a novel approach for the detection of small molecules with molecularly imprinted polymer (MIP)-type receptors. We describe a new strategy for the electrochemical study of captopril (CA) using MIP-GCE (Glassy Carbon Electrode) as a sensor in aqueous solution at pH 3.0. The MIP was characterized by FT-IR, scanning electron microscopy (SEM). The kinetic parameters such as electron transfer coefficient (α), for CA were also determined using electrochemical approaches.

Keywords: Electrochemical study, Captopril, Glassy carbon electrode, Molecularly imprinted polymer

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PS204

Electrochemical oxidation of acetaminophen in the presence of sodium sulfite on GC electrode

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ABSTRACT

Electrochemical methods are more and more widely used for the study of electroactive compounds in pharmaceutical forms and physiological fluids due to their simple, rapid, and economical properties [1]. Acetaminophen (paracetamol) is one of the most extensively employed drugs in the world [2]. It is an effective and safe agent for the relief of mild to moderate pain associated with headache, arthritis and postoperative pain [3].In this work, The electrochemical oxidation of acetaminophen (paracetamol) is carried out in the presence of Sodium Sulfite as nucleophiles using cyclic voltammetry at a glassy carbon. The effect of potential various scan rate (10, 50, 100 mVs^{-1}), on the cyclic voltammetric response of acetaminophen in the anodic region, confirms the quasi-reversibility of the oxidation process. On the other hand, the electrochemical behavior of 1mM acetaminophen has been studied in buffer solution with different pH (2.0, .0, 5.0, 7.0, 9.0 , 11.0) values. It was found that the peak potentials shifted to the negative potentials by increasing pH. The results indicate acetate buffer solution (0. 2 M, pH 5) can be used as the optimum pH using cyclic voltammetry .

Keywords: Electrochemical oxidation, Cyclic voltammetry, Acetaminophen, Sodium sulfite

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PS205

Electrochemical synthesis of 4, 4′-bithiazole homopolymers

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ABSTRACT

Bithiazoles as conjugated polymers (CPs) are promising for a variety of applications on span sensors, photovoltaic cells, electrochromic devices. Especially, CPs show significant advantages over their inorganic analogs in electrochromic field, namely multiple colors and fine-tuning of color through modification of chemical structure, high coloration efficiency, fast switching response and enhanced stability Theelectro chromic mechanism of CPsis that, upon oxidation, CPs are “doped” with counterions and their π-electron band structure become delocalized, then the optical properties change.

It is well known that the intrinsic optical properties of CPs are determined by the energy gap (Eg), which can be tuned by structural modifications. Two routes have been applied to tune the Eg: (1) design and synthesis of novel monomers for polymerization; (2) copolymerization with different monomers.

This paper describes synthesis of homopolymers possessing 4,4′- bithiazole. They were further characterized by^{1}H NMR, ^{13}C NMR, IR, UV-visible spectrophotometric measurements. Electrochemical properties of obtained films, such as effect of electrolyte, polymerization charge, potential limits on the redox behavior were investigated. The band gap of 4, 4′- bithiazole was obtained by in situ spectro electrochemical measurements.

Keywords: Electrochemical, Bithiazole, Homopolymers

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PS206

Investigation of the electrochemical behavior of some bis(4-aminophenyl) derivatives in aqueous solution

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ABSTRACT

Electrochemistry provides very versatile means for electrosynthesis, mechanistic, and kinetic studies. The main goal of the electrochemical studies is the elucidation of the sequence of electron transfer and chemical reactions that occur near the electrode surface and their applications to electrosynthesis of organic compounds[1-3]. Additionally, bis(4-aminophenyl) derivatives are usually used as the monomer, chain extender, or cross-linking agent in the field of polymers[4]. Therefore, detailed mechanistic information is important in the understanding of the stability and in identifying the intermediates structure resulting from the oxidative of these derivatives. In this work, the electrochemical oxidation of bis(4-aminophenyl) sulfide (**TDA**), bis(4-aminophenyl) ether (**ODA**) and bis(4-aminophenyl) methane (**MDA**), has been exhaustively studied in aqueous solutions with different pH values, using cyclic voltammetry, differential pulse voltammetry, chronocoulometry and chronoamperometry. The results showed that the E_p–pH diagram comprise three linear segments with different equations and slopes at pH values 4.3 and 10.1 for TDA, 5.2 and 8.7 for MDA and 5.6 and 8.6 for ODA derivatives. These diagrams indicate that in the aqueous solutions, all three derivatives are in different reduced and oxidized forms, that their relative amounts are dependent on the pH and electrode potential. In the first and third linear segments for all three molecule E_p value shifts by -60 mV/pH. However, at the second segment, the situation is a little complicated. The E_p value for **ODA** is independent of pH, for TDA and MDA shifts by -30 mV/pH. This study has provided new insights into the mechanistic details, pH dependence and intermediate structure of electrochemical oxidation of these compounds.

Keywords: cyclic voltammetry, bis(4-aminophenyl), electrochemical oxidation, mechanistic studies

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PS207

Construction of nanocomposite based on metal-organic frameworks and manganese nanoparticles: Preparation and physicochemical characterization by surface analysis techniques and electrochemical methods

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ABSTRACT

The development of hierarchical metal-organic frameworks (MOFs) has been of considerable interest in gas separation, energy storage and catalysis. Among MOFs, zeolitic imidazolate frameworks (ZIFs) have attracted much attention in recent years due to their fascinating properties. In this work, the Nanocomposite composed from manganese nanoparticles(NPs) and ZIF-8 are fabricated using a facile and simple route for the first time. The incorporation of manganese NPs may overcome the poor electron-conductive properties of most MOFs, which exclude them from being used as electrode materials or electrocatalysts.

The physicochemical features of the constructed Nanocomposite are followed by surface analysis techniques including Atomic force microscopy, Field emission scanning electron microscopy, Fourier transform infrared spectroscopy, X-ray diffraction and electrochemical methods such as cyclic and differential pulse voltammetry and electrochemical impedance spectroscopy. The obtained results indicate that the topology, crystallinity, and porosity of the ZIF-8 structure are maintained throughout the reaction process. The obtained Nanocomposite possess ultrahigh loading capability for immobilization of various biological and nonbiological species in order to construct sensor and biosensors, catalysts and medical application.

Keywords: Metal organic framework, Manganese nanoparticles, Electrochemical Methods

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PS208

2-Pyridinethiol modified Pt-Au, A new electrocatalyst for converting CO_2 to methanol

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Abstract

Reduction of CO_2 has recently attracted considerable attention because of its role in climate change and energy cycle. Here, 2-pyridinethiol (Py) is introduced as a new effective electrocatalyst for the reduction of CO_2 to methanol on a Pt-Au self-assembled monolayer (SAMs) electrode (Pt-Au-S-Py). The reduction of carbon dioxide was carried out at various polarization potentials. Electrolysis of a saturated CO_2 solution at Pt-Au-S-Py showed methanol production with a faradic efficiency of 39% at a polarization potential of –0.2 V (*vs.* Ag/AgCl), which is detected by gas chromatography and ^{13}C-NMR spectroscopy. The results revealed that 2-pyridinethiol, as a heterogeneous electrocatalyst, leads to a decrease in the applied reduction potential.

Keywords: CO_2 reduction; Self-assembled monolayer; 2-Pyridinethiol; Methanol

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PS209

Ozonolysation of indigo carmine: electrochemical and spectrophotometry study

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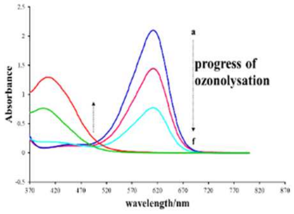
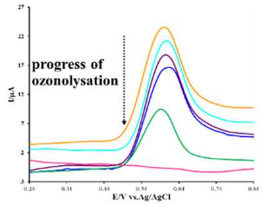
ABSTRACT

Indigo carmine (IC) is a dark blue dye naturally occurring that is a highly prized pigment in antiquity, traditionally extracted from plants of Indigofera genus[1]. It is also used as as an indicator in textile, food and cosmetics industry. Several processes have been proposed and applied for elimination of different kind of indigo[2]. Among these, ozonolysis, paid key attentions and altered methods improved including adsorption, photochemical and electrochemical methods[3].In this work, the UV–visible spectra, cyclic voltammetry and differential pulse voltammetry of IC has been exhaustively studied in aqueous solution.The indigo molecule contains one C=C double bond which can be expected to react with ozone. Ozonolysis of the IC, produces UV-active and electroinactiveproducts [4]. The results show that, the absorption spectrum of IC consists of one absorption bands at 613nm. Our data show as the ozonolysation is carried out, the height of the peak decreases and a new peak appears at 408 nm and its intensity increases.
In addition, differential pulse voltammograms of IC has beenpursuedin the process of ozonolysation. As indicated, increasing of the ozonolysation time leads to decreasing the current of IC peak.Besides, the optimal conditions were obtained by studying the effecting of different parameters, such as, ozonolysation time (5-60 min), initial pH (1-12) and initial IC concentrations (0.5-4 mM). This achievement can be an optimized for the determination of ozone in water by electrochemical and spectrophotometry technique.





Keywords: Ozonolysation, Indigo carmine,Spectrophotometry study,Differential pulse voltammetry

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PS210

External field-effect on the electrical conductivity of molecular nanoelectronic devices

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ABSTRACT

The direct-tunneling electric conduction (G) of a single molecule nanoelectronic devices can be evaluated using the *Landauer* formula, i.e. $G \equiv 1/R = \left(2e^2\tau_{elec}(\varepsilon)\right)/h$, where, $\tau_{elec}(\varepsilon)$ is the electronic transition function, $\tau_{elec}(\varepsilon) \approx \exp(-\beta l)$, here l is the the molecular length and β is the tunneling decay coefficient[1]. Different theoritical/computational models and various surface electrochemistry methods (such as AFM/STM) can be used to measure the β [2-3]. For example, the decay coefficient can be given by, i.e. $\beta \approx \beta_0 \approx 2\alpha\sqrt{2m_e^*\Phi/\hbar^2}$ (at $\Phi > 1\,eV$); and $\beta \approx \beta_0\sqrt{1-(eV/2\Phi)}$ (at $\Phi < 1\,eV$), where Φ is the barrier height. For most organic molecular nanoelectronic devices (electrode-molecule-electrode), Φ is nearly half of HOMO-LUMO gap ($HLG \equiv E_{HOMO} - E_{LUMO}$), and m_e^* is the electron effective mass. Also, for symmetric junctions $\alpha \approx 1$. In this paper, geometry optimization and calculation of the structural and electronic properties of two proposed molecular devices (Au-M-Au, based on the multi-phenyl- rings nanostructure) have been carried out at DFT-B3LYP/6-31G-LANLD2Z level of theory, under different electric field intensities. In addition, field-dependent molecular conductivity (G) are calculated, using *Landauer* formula. Moreover, based on the atoms- in- molecule (AIM) theory, the local intra-molecular charge and energy transfer in these molecular devices are studied. The results show that the HLG gap (and thus G) decreasing (increasing) by increasing field intensity. Also, the local field effect on current–voltage (I-V) behavior, and atomic electronic properties (such as electron density and its laplacian) of these field-effect molecular devices have been investigated using AIM theory.Analysis of these results show that molecular conductivity values increases approximately linearly with increasing electric field intensity. The calculated values (I-V behavior) of the G are compatible with what reported for the values (I-V behavior) of the electrical conductivity in most nanoelertonic molecular systems.

Keywords: Local charge/energy transfer, AIM Theory, *Molecular conductivity, Moleculardevices.*

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PS211

Physi-electrochemical aspect and new trends in composite and hybrid Pseudocapacitors

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ABSTRACT

Redox supercapacitors are attractive energy storage devise that can bridge the gap between a conventional battery and dielectric capacitor due to a combination of high power, fairly high energy density, and long cycle life. Conductive polymers as metal conductive materials or semiconductors are selected as organic polymers that conduct electricity. Conducting polymers such as polyaniline (PANI) are promising electrode materials of the redox supercapacitors, typically demonstrating higher capacitance than electric double-layer capacitor due to high conductivity and good processability. In recent years hybrid nanocomposite of conductive polymer/metal oxide and conductive polymer/carbon based materials have been given considerable attention due to its mechanical and chemical properties and fast electron transfer kinetics [1-2].

In the presented work, different electrosynthesized transition metal oxide, imidazolium based ionic liquid, ceramic material and functionalized graphene oxide/ p- type conductive polymer as composite materials were electrodeposited on the surface of the working electrode and fundamental physielectrochemical aspects, electrochemical performance were evaluated. Surface analysis and different electrochemical methods including galvanostatic charge–discharge experiments, cyclic voltammetry and electrochemical impedance spectroscopy were carried out in order to investigate the applicability of the system as a hybrid supercapacitor.

Keywords: Conductive polymer, Nanocomposite, Impedance, Supercapacitors

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PS212

DFT calculation for reduction potential of Cu complex with N(4)-substituted thiosemicarbazone

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ABSTRACT

Copper complexes of bis(thiosemicarbazone) ligands represent a class of compounds that have recently been the subject of intense research because of their potential as radiopharmaceuticals for the specific targeting of hypoxic tissue [1-4]. This purpose is connected to redox properties of Cu complexes. So in current investigation, one-electron reduction potential of Cu(II)/Cu(I) of copper complex with a symmetric 2-[1-(2-{3-[2-({2-[(4-chloroanilino)carbothioyl]hydrazono}methyl)phenoxy]-2-hydroxypropoxy}-phenyl)methylidene]-N^1-(4-chlorophenyl)-1-hydrazinecarbothiamide ligand (H_3L) was theoretically calculated by the density functional theory (DFT) B3LYP/6-31++G(d,p) level in solution phase. The effects of solvation in DMF solvent were incorporated as a self-consistent reaction field (SCRF) using the polarisable continuum model (PCM) and are found to be essential for quantitative agreement. The resulting estimate potential (E_{cal}) showed a good agreement with the experimental potential (E_{exp}) derived from cyclic voltammetry.

Keywords: Redox potential calculation, Thiosemicarbazone, Cyclic voltammetry, Copper

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PS213

Steel coated nano-PbO_2 for oxidation of chloride to perchlorate

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ABSTRACT

Electrode coatings are now extensively employed to improve the performance of modern electrochemical technology [1]. Lead dioxide coatings have a low cost compared to those based on precious metals, high electrical conductivity (comparable to metals), high oxygen over potential and good stability in controlled conditions leading to possible application in new processes present study. This paper focuses on lead dioxide coatings, formed ex-situ by electrodeposition onto inert substrates such as stainless steel from aqueous electrolytes containing Pb(II)[2].

$$Pb^{2+} + 2H_2O \longrightarrow PbO_2 + 4H^{+} + 2e$$

Lead dioxide electrodes can only be used in applications that require a rather positive potential. If a potential positive to the equilibrium potential is applied, the coating will be protected from corrosion. On the other hand, at any potential significantly negative to the equilibrium potential, cathodic reduction and dissolution of the lead dioxide coating are to be expected. In present study nanostructured layer has been made in aqueous solution of lead(II)nitrate on the surface of stainless steel as anode in the constant current. The purpose was synthesis the β-PbO2 on stainless steel that XRD investigation confirmed desired product. Refinement of the β-PbO_2 structure converged well and the extent of crystal faulting appeared to have been much less. The recognition of this structural degree of freedom in PbO_2 is significant in view of its potential influence on properties such as electronic conductivity and electrochemical activity. The electrode was used for oxidation of chloride to chlorate. In the second stage oxidation of chlorate to perchlorate was investigated [2].

Keywords: Lead(II) nitrate, Oxidation, electrodeposition**,** β-PbO_2

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PS214

A new electrochemical method for the synthesis of magnetite nanoparticlesand its application in the removal of some heavy metals and dyes

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ABSTRACT

Many technologies such as ion exchange,reduction flocculation,membrane filtration, precipitation, filtration and reverse osmosis have been proposed by different scientific works for the removalof heavy metalfrom aqueous solution and effluents. However most of these technologies require high operation cost and also generate toxic sludge [1].Magnetite with chemical formula Fe_3O_4, is one of the most important magnetic compounds that is widely used in industry [2] and wastewater treatment [3]. In last two decays using of magnetite nanoparticles increased because of their strong superparamagnetic properties, good biocompatibility and low toxicity. One of important usage of Fe_3O_4, is in drug industrial such as targeted drug delivery, hyperthermia treatment, cell separation, magnetic resonance imaging, immunoassays and the separation of biochemical products [4] and also removal of heavy metals and dyes.

In past studies synthesis of nanoparticle of magnetite has some problem like require high temperature, expensive reactant, long time period to obtain final product. These disadvantages encourage us to design new method that solve these problems.In our research we used a facileelectrochemical method without any reagent except NaOH.The synthesized nanoparticles were characterized by with XRD spectra, SEM and IR. It was also found that, the average size of the synthesized nanoparticles are 50 nm. In addition, these nanoparticleswere tested for the removal of heavy metals such asnickel and chromium and dyessuch as malachite green.The results of UV spectra confirmed successful removal of these compounds (about 95%).

Keywords: Electrochemical, Magnetite nanoparticles, Removal, Heavy metal, Dye

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PS215

A green galvanostatic method for the synthesis of di-arylsulfny-2-acetamidophenol derivatives

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ABSTRACT

Electrochemistry has emerged as a powerful tool for the synthesis of complex organic molecules [1]. Unique selectivity because of in situ formation of an active species at the interface, inversion in polarity by transfer of electron and variability in product formation by control of potential are some of advantages of electrosynthesis [2]. The applicability of the electrochemical synthesis of the product was improved by means of galvanostatic electrolysis. Among the electrochemical parameters for the synthesis of organic or inorganic compounds, the current density is one of the most important factors influencing the yield and purity. This factor can also play an important role in determining the dominant reaction at the surface of the electrode [3]. In this study, the current density varied from 0.3 to 2.4 mA/cm^2,was used . The highest yield was obtained at the current density of 0.3 mA cm^{-2} .Higher current densities result in an increase in side reactions such as the oxidation of product, solvent and …resulting in a decrease in product yield.

Keywords: Electrosynthesis, Galvanostatic, Current density

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PS216

Study of mixed micellezation between surfactant and ionic liquid at different compositions using conductometric technique

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ABSTRACT

Micellization or self-aggregation of amphiphilic molecules in solution is an important phenomenon in the field of colloid and interface science. Today, there are many new techniques available for determination of critical micelle concentration (CMC) of ionic surfactant. Conductivity measurements give a specific response to ionic components in pure state; these methods provide extremely sensitive and versatile detectors for chemical composition[1]. In this work, the micellization behavior between an amphiphilic ionic liquid(1-dodecyl-3-methyl imidazolium bromide) and cationic surfactants (DOTAB and TTAB) has been studied using conductometric technique at different concentrations. The specific conductivity measurements (k) of the amphiphilic solutions (Ionic Liquid and surfactant) and their mixtures were carried out at 30.0 ± 0.1 ˚C with a digital conductivity meter (Consort, Model C 860). A dip type conductivity cell with cell constant of 1.01 cm−1 was used. The critical micelle concentration (CMC), interaction parameter (β^{m}), mixed micellar composition (X_1^{id} , X_2^{id} , X_1^{m} and X_2^{m}), extent of counterion binding(α) and thermodynamic parameters for the micellization process have been calculated and discussed. For all mixtures of IL/surfactant, the results indicate a fairly strong attractive interaction (negative β^{m} -values), which confirming synergistic interactions between ionic liquid-surfactant. Also, activity coefficients (f_1^{m} and f_2^{m}) are always less than unity suggesting non-ideality in the mixtures[2]. Finally, the standard Gibbs energy of micellization (ΔG_{mic}^{0}) and the excess free energy of micellization(ΔG_{mic}^{ex}) values were evaluated and discussed with increasing surfactant concentration.

Keywords: Conductivity, Surfactant, Ionic liquid, Micelle, Counter ion

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PS217

Electrochemical preparation and characterization of poly (1, 5-diaminonaphthalene) in the presence of nanoparticles

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ABSTRACT

Conducting polymers (CPs) such as polyaniline (PAn) have been studied extensively due to their electronic application including energy storage devices, batteries, electrochemical sensors and others [1-2]. These applications have prompted studies of the electropolymerization of aromatic hydrocarbons containing hydroxyl or amine groups. 1,5-Diaminonaphthalene (Fig. 1) is an organic compound with two NH_2 groups, as an electrochemical substance is interest for electrochemical studying and has been used for the preparation of polymeric film-coated electrode [3]. In this paper, the electrochemical polymerization of 1,5-diaminonaphthalene (1,5-DAN) on the gold electrode in 1.0 M $HClO_4$/ethanol solution have been studied by the repeated potential cycling method. The electropolymerizaetion of 1,5-DAN in the absence and presence of nanoparticles (Titanium dioxide) were carried out in the potential range between -0.2 and 0.9 V. The polymer films were observed on the elctrode surfaces after 60 cycles. The polymer films were characterized by FT-IR spectroscopy and conductivity measurments. Moreover, the effect of nanoparticles on electropolymerization process and polymer backbone were investigated.

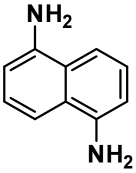

Figure 1: The structure of 1,5-diaminonaphthalene.

Keywords: Electropolymerization, Nanoparticles, 1,5-diaminonaphthalene

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PS218

An Efficient Electrochemical Method for the Synthesis of New Benzofurochromen-6-one

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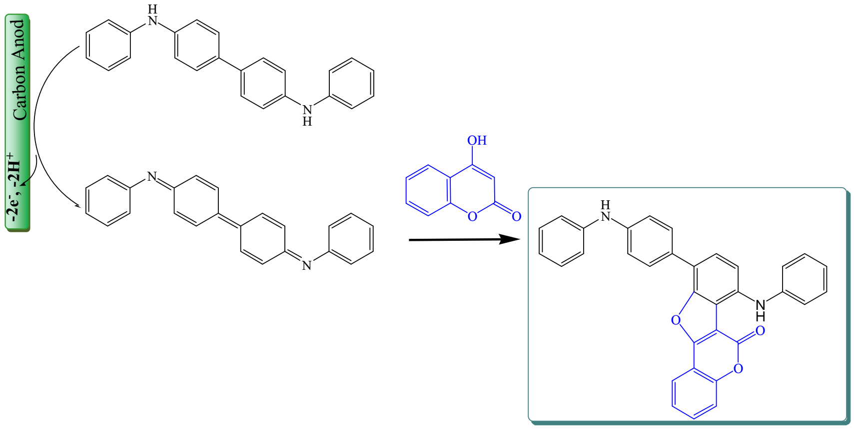
ABSTRACT

Coumarin derivatives are of interesting compounds because of their broad spectrum of pharmacological and biological properties including anticoagulant, spasmolytic and rodenticidal activities [1–2]. A literature survey revealed numerous reports on the antiproliferative, antitumor, antifungal and anti-HIV activities of a variety of coumarin compounds [3]. There is, therefore, a great need to develop efficient protocols for synthesis of these important compounds.

In this research the electrochemical oxidation of *N*,*N*′-diphenylbenzidine (DPB) has been studied in the presence of 4-hydroxy cumarin as a nucleophile using cyclic voltammetry and constant current electrolysis methods. The results indicate that 4-hydroxy cumarin participate in Michael type addition reaction with the oxidized form of DPB (DPB_{OX}), converts it to the corresponding product via EC mechanism (Scheme 1). The product was characterized by its physical and spectroscopic data. This method provides a mild and one-pot procedure for the synthesis of new benzofurochromen-6-one with high atom economy and high current efficiency.



Scheme 1

Keywords: Coumarin derivatives, *N*,*N*′-diphenylbenzidine, Michael type addition, benzofurochromen.

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PS219

Investigation of the electrochemical behavior of some nitroarenes in water at room temperature

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ABSTRACT

Nitroarens compound such as nitrobenzene and cloronitrobenzene, which have toxic and hazardous effects on all living organisms, including humans, animals and crops even at trace concentrations[1] Nitrobenzene (NB) is one class of hazardous pollutants [2]. NB used for production of paints, solvents and aniline.[3] Therefore, conversion of NB into useful compounds such as hydroxylamine is important. Cyclic voltamogram of NB under N_2 atmosphere was studied in details. In CV (starting and switching potentials are -0.1 V and -1, 0.7 V *vs*. Ag/AgCl, respectively) NB doesn't undergo electrochemical oxidation and reduction reactions. But, upon scanning to negative and then positive potentials, the CV exhibits one irreversible cathodic peak (C_0) at -0.6 V related to conversion of NB to phenylhydroxylamin (ArNHOH) and also a reversible system (A_1/C_1) ascribed to the phenylhydroxylamin/nitrosophenyl (ArNHOH/ArNO) couple.

Keywords: Nitroarene, Nitrobenzene, Nitrobenzene, Phenylhydroxylamin, Cyclic Voltamogram

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PS220

Extention of pulsed electro membrane extraction and studying of the membrane behavior by impedance analysis based on Laplace transformation

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ABSTRACT

In The last research Davarani et al., have developed a novel extraction setup capable of impedance analysis of the system during the extraction process. The setup applies a couple of short voltage pulses at 1 min periods and stores the resulting current in order to obtain impedance information based on Laplace transformation. It has been shown that the obtained impedance information provides useful knowledge about time dependence of double layer capacitance, the effect of experimental parameters on kinetics of analyte depletion and total permeability of the SLM. It has also been demonstrated that impedance analysis is a powerful tool for the estimation of optimum experimental parameters without determining the analyte in the acceptor phase.

In this work an impedance system was developed to investigate time variation of solution resiatnce, membrane resistance and double layer capacitance during electromembrane extraction from salty solutions. For this purpose, the effect of salts such as NaCl, NaF, $NaNO_3$, KNO_3, KCl and LiCl was studied in the EME of Naproxen as a model and the acceptor phase of EME was analysed by HPLC. The impedance analysis results showed that the hydration enthalpy of the accompanying ions has a significant effect on time dependence of solution resistance and double layer capacitance. NaF is the only case, in which the solution resistance rose upon time. For the rest of salts, the solution resistance decayed at different time scales. At a salt concentration of 1%, the nitrates (KNO_3 and $NaNO_3$) revealed sharper decays followed by flattening of the curves around 15 min. The chlorides (KCl, NaCl and LiCl) showed smoother decays within 25 min. By increasing the salt concentrations, the flattening of the solution resistance values took place at slightly longer times but the order of decay was obeyed. At a concentration of 1%, the nitrates caused steep rise of double layer capacitance after 15min. the greatest slope (and maximum) was observed for KNO_3. The latter was succeeded by $NaNO_3$ in the second order. With a significant distance, KCl, NaCl and LiCl were in the 3rd, 4th and 5th order, respectively. By increasing the concentration, the same order was observed but the distance between the double layer capacitance values arisen from different salts (except NaF) reduced. Finally, all of the nitrates and chlorides showed very similar time dependence of capacitance at a concentration of 4%. In comparison with the rest of the salts, NaF caused negligible capacitance at all concentrations. It was also shown that the suppression of recovery is meaningfully correlated with the rate and extent of depletion of ionic species from the donor solution as well as the propagation of double layer.

Keywords: Electromembrane extraction; Impedometric monitoring; Supported liquid membrane

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PS221

Electrochemical synthesis of copper nanporaticles on porous gas diffusion electrodes in polymer electrolyte membrane fuel cells with modulation potential method and inhibitor efficiency of thioure for corrosion parameters of copper

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ABSTRACT

In this study, electrochemical method is developed for efficient preparation of Cu crystals on Nafion-bonded carb on paper electrodes as a core material in Pt based catalyst layer for a polymer electrolyte membrane fuel cell. Copper nanoparticles with diameter distribution of 80-160 nm are obtained by potential-modulation electrodeposition. In copper electrodeposition the charge-transfer step is fast and the rate of growth is controlled by the rate of mass transfer of copper ions to the growing centers. After the copper electrodeposition the Cu deposited electrode was immersed in thiourea with flowing N_2 for 20min. The nature and composition of Cu/GDL are characterized by field emission–scanning electron microscopy and energy dispersive X-ray spectroscopy, respectively. The inhibition efficiency also was examined in acidic chloride media, by means potentiodynamic polarization measurements. Polarization curves showed that the presence of thiourea decreases the corrosion current density and corrosion rate and enhance the polarization efficiency for copper.

Keywords: Electrochemical synthesis, Copper nanoparticles, Gas diffusion layer, Fuel cell, Inhibitor

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PS222

Electrochemical study of dibenzo-xanthene derivatives at a bare glassy carbon electrode

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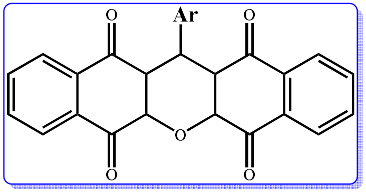
ABSTRACT

Nowadays Xanthene and Dibenzo-xanthens derivatives are very important because of their antibacterial, antiviral and anti-inflammatory properties and have extensive use in biological and medical fields. [1,2]. The other useful applications of these heterocycles are as leucodyes and in laser technologies [3]. Furthermore, electrochemistry offers many novel and versatile methods for the study of electroactive compounds in pharmaceutical forms due to their simple, rapid, and economical properties. As an electroactive substance, dibenzo-xanthene derivatives has also attracted much interest. In this work, the electrochemical behavior of some aryl-5*H*-dibenzo[b,i]xanthene-5,7,12,14(13*H*)-tetraone derivatives (ADBXT), has been studied using cyclic voltammetry and differential pulse voltammetry. The cyclic voltammograms of these compounds display two redox peaks correspond to the reduction of two *p*-benzoquinone rings presence in the structure of the molecule to the corresponding hydroquinone forms. It was also found that the presence of hydroxy group on the phenyl ring is an effective factor in electrochemical behavior of these molecules. Based on our voltammetric data, the electrochemical oxidation of 4-hydroxy and 3-hydroxy phenyl derivatives exhibits an irreversible anodic peak (A_2) at +1.03 V versus Ag/AgCl correspond to the oxidation of phenol substituent on molecule, while this peak is not observed for other derivatives. In addition, the effect of potential scan rate, on the cyclic voltammetric response in anodic region confirms the irreversibility of the oxidation process corresponding to peak A_2. Furthermore, the effect of pH and adsorption activity of ADBXT derivatives was also studied.



13-aryl-5H-dibenzo[b,i]xanthene-5,7,12,14(13H)-tetraone

Keywords: Cyclic voltammetry, Dibenzo-xanthene derivatives, Mechanistic studies, Electrochemistry

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PS223

Effect of aryl diazonium salts on enhancement of corrosion protection efficiency of graphene: Comparison between number of phenyl rings and azo groups

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ABSTRACT

Recently we reported barrier properties of graphene layer made by electrochemical reduction of produced graphene oxide nanosheets [1]. In the present study we have developed a method of coating carbon steel (CS) surface with modified graphene layer for corrosion protection. Modification of the graphene-coated CS surface (CS-G) via diazonium formation route was carried out by attachment of phenyl groups using phenyl diazonium (PD), 1-naphtyl diazonium (1-ND), and 1,8 naphtalene diazonium (1,8-ND) compounds to provide a more anticorrosive barrier that blocks gases, liquids and aggressive chemicals. The coatings were characterized by FT-IR, Raman, XRD, SEM-EDX and TEM techniques. The anti-corrosion performance of the coated layers was evaluated by weight loss and electrochemical methods such as potentiodynamic polarization and electrochemical impedance spectroscopy in NaCl 3.5%. Also, the hydrophobic ability of coatings was evaluated using water contact angles measurements. The results showed that modified graphene coatings offer a better PE% than the non-modified graphene. Defect restoration of graphene impede the corrosion reaction by covering the initiation corrosion sites on the CS surface via the assembling of hydrophobic functions like phenyl groups [2,3]. Moreover, the number of phenyl rings and azo groups ($-N_2$) can affect charge transfer resistance (R_{ct}), corrosion potential (E_{corr}), current density (I_{corr}) and the slope of the anodic and cathodic reaction ($\beta_{a,c}$). The obtained results proved that the diazonium salts with 2 phenyl rings shows higher PE% than those of with 1 phenyl ring. Probably it is due to the formation of more impact protective layer. In addition, the diazonium salts with 2 azo groups demonstrates higher PE%. Because the grafting of diazonium salt to graphene layer is performed via evolution of N_2 and formation of covalent C-C bonds [4]. Finally the obtained results showed that PE% was observed in order CS/G-1,8ND<CS/G-1ND<CS/G-PD.

Keywords: Aryl diazonium salts, Graphene, Corrosion, Surface restoration, Carbon steel.

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PS224

Atropa belladonna L. leaves extract as eco-friendly corrosion inhibitor for 304 stainless steel in 15 % HCl

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ABSTARCT

The toxic effects of synthetic compounds that used as corrosion inhibitor of metals in different environments, led to use of natural products as environmental non-harmful anti-corrosion materials [1-4]. *Atropa belladonna L.* extract contains tropane alkaloids such as atropine and scopolamine that atoms of oxygen, nitrogen and aromatic rings exist in their structures which is possibility of their adsorption on the metal surface. Therefore, in this research, this extract was chosen as corrosion inhibitor of stainless steel in 15 % HCl that in industry is used in pickling stage. The classical method of weight loss and electrochemical methods (polarization and impedance spectroscopy) was used in this study. For all three methods, the highest percentage of inhibition was obtained for 1.2 g/L of extract and with increasing higher concentration of extract, the protection effect was remained constant. Research for the effect of temperature on the performance of extract with electrochemical polarization method (at temperature range of 65- 35°C) indicates a decrease in the percentage of inhibition of extract by increasing the temperature. Adsorption of molecules of extract on the stainless steel is complies with Langmuir isotherm at all examined temperatures. By using the results of thermodynamic calculations, the adsorption of molecules of extract on the stainless steel were reported as physical adsorption.

Keywords: Corrosion inhibitor, Atropa belladonna L., Leaves extract, H acid, Electrochemical impedance spectroscopy, 304 stainless steel

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PS225

Corrosion behavior of nickel electrode in chloralkali cells

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ABSTRACT

In chloralkali industry cathodes were made of solid nickel that hydrogen evolution reaction (HER) was occur on surface. In this process corrosion of nickel electrode was observed. The corrosion behavior of nickel was investigated in acidic, neutral and alkaline solutions for improve the process of chemical machining Nickel and it s alloys. [1,2]. This work reports the reason of Nickel corrosion in 8 M NaOH solution .Electrochemical activities of the cathodes are characterized through Tafel polarization measurement and cyclic voltammetry .The results indicate that hydrogen diffuse in Nickel electrode and cathode corrosion was observed in chloralkali process. Diffusion of hydrogen in Nickel in effects on it s behavior such as mechanical properties.

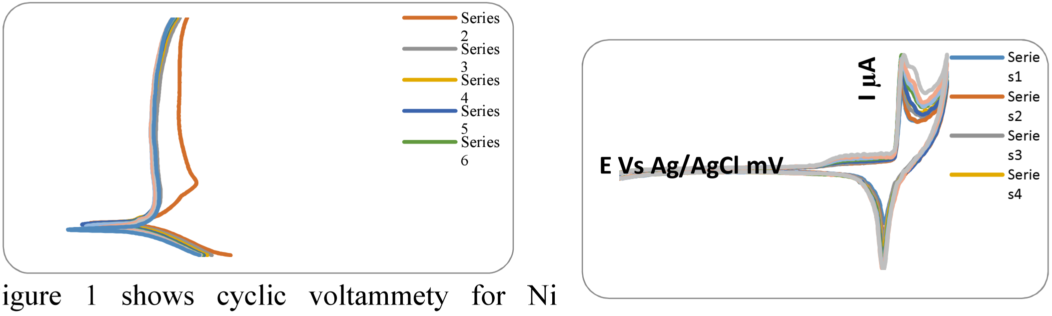

Figure1) cyclic voltammetry Figure2) Tafel polarization with stopping time 1)0S 2) 10S 3)20S 3)30S 4)40S 5)50S 6)100S 7)150S 8)200S for Nickel electrode

Figure 1 shows cyclic voltammety for Ni electrode in range of -1 to 0.5 V with scan rate 50 mV/S in 8 M NaOH solution. It is clearly seen in fig1 that with increasing of stopping time in cathode potential, Ni^{2+}/Ni^{3+} peaks become nobler. The Tafel plots obtained for Nickel electrode in range of -1.2 to 0.2 and scan rate 50 mV/S in 8 M NaOH are shown in figure 2. Polarization curves reports the corrosion current (i_{corr}) decrease by increasing stopping time in hydrogen evolution potential.

Keywords: Cathode corrosion, Hydrogen evolution reaction, Chloralkali

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PS226

Evaluation of alkaline hydrogen evolution reaction enhancing on Ni-Co/rGO in comparison to Ni/rGO

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ABSTRACT

In order to enhance the non-noble metal electrocatalytic activity in hydrogen evolution reaction (HER) for the application in the cathode of alkaline water electrolyzers, it is interesting to use the appropriate supports such as graphene with the high electronic conductivity and surface area [1]. Also, alloying the transition metals can improve their electrocatalytic activity. At this investigation, Ni-Co nanoparticles grown on the reduced graphene oxide (rGO) were synthesized via a chemical reduction method. After characterization, the obtained material was compared with Ni on rGO in HER at alkaline media. Fig. 1 shows the linear sweep voltammograms (LSVs) of the samples in HER at the KOH solution.

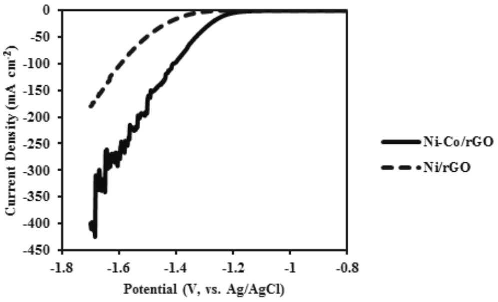

Figure 2. LSV of HER curves for Ni/rGO and Ni-Co/rGO in 1 M KOH at 298 K

Reducing the onset overpotential from -178 to -98 mV, significant enhancement of Tafel slope from -113.4 to -105.5 mV dec^{-1} and reducing the obtained overpotential at each current density for Ni-Co/rGO compared to Ni/rGO are representatives of the synergistic effect between Co and Ni nanoparticle.

Keywords: Ni nanoparticles, Hydrogen evolution reaction, Alkaline media, Synergistic effect

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PS227

Immobilization of platinum nanoparticles on para- aminobenzene modified electrode: Electrocatalytic activity for oxidation of methanol

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ABSTRACT

In this work, platinum nanoparticles were deposited onthe surface of para-aminobenzene modified glassy carbon electrode (GCE). The catalystis characterized by scanning electron microscopy, energy dispersive spectroscopy and electrochemical methods. The electrocatalytic activity of the modified electrode for methanol oxidation reaction was investigated. Nitrobenzene was covalently attached to the surface of GCE and then electrochemically reduced to aminobenzene according to our previously reported work [1].The modification was completed by attachment of platinum nanoparticles via electrochemicalreduction of $PtCl_6^{-2}$ on the surface of aminobenzene-modified-GCE.The CVs of GC electrodes containing Pt-GCE and Pt-aminobenzenemodified GCE (Pt-NH_2-GCE)is recorded in 0.5 M H_2SO_4 solution containing 1.0 M CH_3OH.Two oxidation peaks are observed, which are related to the oxidation of methanol and intermediates, appear at 0.68 and 0.52 V vs Ag/AgCl, respectively. It can be observed that the catalytic activity of Pt-NH_2-GCE is higher than that of Pt-GCE by about 2.0 times.TheI_f/I_bratio of Pt-NH_2-GCE is substantially higher than that of the Pt-GCE, showing better catalyst tolerance of Pt-NH_2-GCE. Moreover, the prepared Pt-NH_2-GCE showed better stability during the long-term circle experiment.

Keywords: Diazonium salts, Fuel cell, Platinum nanoparticles, methanol oxidation.

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PS228

Platinum and platinum–ruthenium nanoparticles supported on brilliant cresyl blue and their electrocatalytic performance for methanol oxidation

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ABSTRACT

In the existing work we illustrate a new electrode substrate with electropolymerization of brilliant cresyl blue (PBCB) and fabrication of polymer film modified electrode. Then platinum and ruthenium metal is inserted into the polymer by electrodepositing of Pt and Ru from hexachloroplatinic acid and ruthenium chloride solutions with applying potentiostatic technique. The electrocatalytic oxidation of methanol was studies by cyclic voltammetry (CV), chronoamperometry (CA) and electrochemical impedance spectroscopy(EIS) methods at the surface of modified electrodes. The surface morphology of scanning electron microscopy (FESEM) analysis reveals a homogeneous dispersion of Pt/Ru particles on the PBCB matrix. It found that the attendance of poly brilliant cresyl blue (PBCB) film increases the efficiency of deposited Pt/Ru microparticles into the oxidation of methanol. The effects of various parameters such as the number of scan polymer formation, potential, time of deposition and methanol concentration to predict the tolerance electrode on the electrocatalytic oxidation of methanol were also studied, Results showed that the Pt-5Ru-PBCB/GC catalyst presented the best electrocatalytic activity and good abillity to its application in DMFC anodes.

Keywords: Brilliant cresyl blue, Fuel cell, Codeposite

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PS229

Electrochemical evaluation of the PANI based nanocomposite modified by graphene nanosheet, carbon nanotube, and Pt nanoparticles, as a supercapacitor electrode

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ABSTRACT

Nowadays application of the new tools that utilize advanced technology increased in human life, which in their construction new and intelligent materials are used. One of the most versatile technologies is supercapacitors (SCs). Recently, application of SCs in emergency doors on Airbus A380 airplanes is reported [1], and they are also used in industrial power supplies, memory backup systems, and energy management [2, 3]. Furthermore, a great attention has been focused on the application of new materials to significant enhancement in electrochemical storage capacity of SCs. Here, polyaniline (PANI) based nanocomposites were synthesized, via reduction of platinum nanoparticles into a modified PANI with graphene nanosheets (GNS) and/or carbon nanotubes (CNT). The morphology and chemical composition of the prepared nanocomposites were characterized by using XRD, EDXA, FT-IR, SEM, and TEM techniques. The electrochemical properties of the resulting nanocomposites in comparison to pure PANI were systematically studied by using cyclic voltammetry (CV), galvanostatic charge-discharge (GCD), and electrochemical impedance spectroscopy (EIS) tests, for the first time. A remarkable average electrode specific capacitance as 3450 F g^{-1} (based on PANI/GNS/CNT/Pt nanocomposites) was obtained in 1 M H_2SO_4 solution in comparison to 1123, 952, 366 and 284 F g^{-1} for PANI/GNS/Pt, PANI/GNS/CNT, PANI/CNT/Pt and pure PANI, respectively. Observed outstanding performance for the quaternary nanocomposites, is not only due to the presence of GNS and CNT which can offer good electrical conductivity, but also associate with a high surface area and conductivity dedicated from Pt nanoparticles and a high redox activity of PANI. Furthermore, the PANI/GNS/CNT/Pt nanocomposite present excellent long cycle life with 82.8% specific capacitance retained after 1000 charge-discharge processes. The observed high performance of PANI/GNS/CNT/Pt electrode makes it attractive for the development of high-efficiency electrochemical energy storage devices.

Keywords: Supercapattery, Graphene nanosheets, CNT, PANI, Pt nanoparticles.

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PS230

Synthesis of sulfur-doped graphene and study of electrocatalytic activity for oxygen reduction reaction

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ABSTRACT

Doping is an important method to modulate the electronic properties of graphene. Among various types of doped graphene, sulfur-doped graphene is expected to have a wider band gap due to the electron-withdrawing character of sulfur. However, it is difficult to dope graphene with sulfur because sulfur atom is much larger than C atom. In this study, we developed a low temperature, economical and facile onepot hydrothermal method to synthesis S-doped reduced graphene oxide (S-RGO) nanosheets. The percentage doped atoms in graphene is an effective factor in improving the properties of its electrochemical. Here, we changed some of parameters and increased value of doped sulfur in graphene sheets which associated with electrocatalytic properties in the oxygen reduction reaction (ORR). The as-prepared S-RGO has advantages such as a high S content, high-quality sulfurated species (mainly as C–S–C–), numerous open edge sites and defecting on its surface which are beneficial for the improved ORR catalytic activity. Electrochemical characterizations of the synthesized nanocatalyst S-RGO clearly demonstrated the excellent electrical conductivity and superior electrocatalytic activity for oxygen reduction reaction (onset: -0.11 V), compared to the commercial Pt/C catalyst.

Keywords: Doped graphene, Sulfur, Oxygen reduction reaction.

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PS231

Modification of graphite screen printed electrode with GR/Fe_3O_4@SiO_2 nanocomposite for simultaneous voltammetric determination of vitamin C and vitamin B_6

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ABSTRACT

Vitamins constitute a group of compounds, which are essential to human body for health, nutrition and normal growth, self maintenance and functioning of human and animal bodies. Vitamin C and vitamin B_6 belongs to the water-soluble vitamins. Leftover amounts of the vitamin leave the body through the urine. That means body need a continuous supply of such vitamins in the diet [1]. Therefore, the simultaneous determination of vitamin C and vitamin B_6 is a very important and highly valuable topic in clinic medicine. Electrochemical techniques with the advantages of quick response, low detection limit, low cost, simple operation and the absence of pretreatment has been increasingly applied to the detection of analyte. The screen-printed electrodes (SPEs) have been designed especially for miniaturization of electrochemical analytical systems [2]. Further, the modification of electrodes surfaces using nanomaterials have been good electro catalytic activity, sensitivity, and selectivity; it has also a low detection limit compared to unmodified electrodes. Graphene, as a novel one-atom thick planar sheet of sp^2 hybridized carbon atoms packed in a honeycomb lattice. In addition, graphene based composites for example; GR/Fe_3O_4@SiO_2 can be deeply investigated as novel electrode modification materials for the improvement of sensing sensitivity [3]. In this work, differential pulse voltammetry was used for simultaneous determination of vitamin C and vitamin B_6. The results revealed that GR/Fe_3O_4@SiO_2 modified SPE promotes the rate of oxidation compared to the bare SPE, by increasing the peak current. The linear ranges were 0.5 100.0 µM and 1.0-200.0 µM, respectively for vitamin C and vitamin B_6. In addition to its high performance, this inexpensive sensor is perfectly stable for simultaneous determination of these species in real samples.

Keywords: Vitamin C, Vitamin B_6, GO/Fe_3O_4@SiO_2 nanocomposites, Graphite screen printed electrode, Modified electrode.

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PS232

Electropolymerized β-cyclodextrin modified glassy carbon electrode as a platform for naringin electroanalysis

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ABSTRACT

Naringin is a flavonoid occurs naturally in tomato, and citrus fruit [1]. Many therapeutic effects of naringin, such as antioxidant and antiallergic properties also its protective effect against oxidative damage have been confirmed[2]. High performance liquid chromatography has been utilized as a conventional method to determine flavonoids in natural matrices[3].Electrochemical methods are good alternatives for analysis of flavonoids because of their simplicity, ease of operation and low expenditures in comparison to HPLC. Here in this study a new and simple electrochemical sensor have been designed for determination of naringin. Glassy carbon electrode was modified with conductive β-cyclodextrin polymer performing cyclic voltammetry over the range of -2 V to 2 V for 6 cycles. The electrochemical behavior of naringin was studied using the modified electrode and a significant enhancement in the oxidation current of the analyte was observed in the presence of the modifier. Adsorptive striping differential pulse voltammetry was used to quantify naringin under the optimized conditions. The linear calibration range was 500 to 1500 ng mL^{-1} with the detection limit of 300 ng mL^{-1}. The proposed sensor was successfully used to determine naringin in grape fruit as a real sample.

Keywords: Naringin, Electrochemical detection, Stripping voltammetry

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PS233

A novel carbon paste electrode based on ion-imprinted polymer for determination of lead (II)

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ABSTRACT

Heavy metals are major pollutants in the environment due to their toxicity and threaten creatures and human being at high concentration [1]. Lead is the most toxic metal, that presence of it in water causes harmful effects on human health [2]. This metal has been extensively studied and their effects on human health regularly reviewed by international bodies such as the WHO [3]. In this research, a novel Pb(II) ion-imprinted polymer were prepared on the surface of the polymer beads. An obvious difference in the response was observed between the electrodes modified with ion imprinted polymer (IIP) and non imprinted polymer (NIP), indicating proper performance of the recognition sites of the IIP. The effect of pH, type of electrolyte and interferents on the performance were investigated and optimized. The electrochemical procedure was based on the accumulation of Pb(II) ions at the surface of the modified carbon paste electrode and analysis with differential pulse voltammetry. Under the optimum conditions the peak current was linear to the concentration of lead in the range 0.05 to 0.8 µM with a correlation coefficient of 0.96. The limit of detection (LOD) was found to be 0.01 µM (S/N=3). The sensor was successfully applied for the trace lead determination in water samples.

Keywords: Determination of lead, Ion imprinted polymer, Differential pulse voltammetry

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PS234

Application of palladium-copper bi-metal electrocatalyst modified electrode for the oxidative determination of nitrite

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ABSTRACT

Nitrite mainly used as an additive in some food products they are used to prevent corruption. Nitrite toxicity of cancer-causing nitrosamine formation arises form. For this reason, control of nitrites in protecting the environment and human health is an important issue. In recent years many methods are used to measure nitrite (such as spectroscopy, chromatography, polarography) [١،٢]. Electrochemical methods are favorable for easy use and quick response methods. In the present work, elecrocatalytic oxidation of nitrite in buffer media was investigated on the palladized copper modified electrode and optimal conditions for the Pd/Cu modified electrode preparation including metallic palladium deposition time and deposition solution concentration, concentration and pH of background electrolyte was obtained by cyclic voltammetry. Under optimized conditions, calibration graphs were linear over the range 1-50 mM of nitrite with acorrelation coefficient more than 0.998. By using differential pulse voltammetry method the calibration curve is linear in the rang 3-50×10^{-4} M with a detection limit of 2.65×10^{-4} M. So By using amperometric method hydrodynamics, nitrite concentrations measured in the range 3-45×10^{-4} M with a detection limit 2.2×10^{-4} M.

Keywords: Nitrite, Alladized copper modified electrode, Cyclic voltammetry

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PS235

Magnetic electrospun $CoFe_2O_4$ nanofibersas sensing element of magnetic bar carbon paste electrode modified with graphene oxide for rutindetermination

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ABSTRACT

Rutin, a kind of the most abundant bioactive flavonoid called as vitamin P, is widely present in vegetables and fruits. It has a wide range of physiological activities including anti-inflammatory, anti-tumor and anti-oxidant[1]. In this study we have prepared a magnetic bar carbon paste electrode (MBCPE) modified with cobalt ferrite ($CoFe_2O_4$) magnetic *electrospun*nanofibers ($CoFe_2O_4$NFs) and graphene oxide (GO) for the electrochemical determination of rutin. The $CoFe_2O_4$NFs was spined by the electrospinning method using a solution that contained poly(vinyl pyrrolidone) (PVP) and cheap Co and Fe nitrates as metal sources. The as-spun and calcined $CoFe_2O_4$/PVP composite samples were characterized by FT-IR, SEM and TEM [2]. Carbon paste was prepared by hand mixing GO, $CoFe_2O_4$NFs and graphite. This paste was then packed into the end of a glass tube and a very small magnetic bar was inserted into the tube to be coated with the carbon paste to provide a magnetic field. The MBCPE was used to attract the magnetic nanofibers to the electrode surface.

The electrochemical behavior of rutinwas investigated at MBCPE/GO/$CoFe_2O_4$NFs by cyclic voltammetry and differential pulse voltammetry techniques in citrate buffer solution (pH=4.8). MBCPE/GO/$CoFe_2O_4$NFs as a novel electrochemical sensor exhibited a very high electroactive behavior toward rutin. The proposed sensor showed large specific area and rapid redox properties, which makes it an excellent sensing platform for sensitive determination of rutin. It effectively accumulated on the sensor and caused a pair of redox peaks at around 0.455 and 0.395 V.

Keywords:Magneticelectrospinning, Magnetic bar carbon paste electrode, Cobalt ferrite magnetic nanofibers, Rutin

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PS36

Antifouling properties of cellulose nanocomposite for determination of insulin

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ABSTRACT

Human insulin is a globular protein that consists of two polypeptide chains linked by two disulfide bridges. The detection of insulin is of great importance for clinical diagnostic, because it serves as a predictor of diabetes, insulinoma and trauma. Many of methods used for insulin detection have the drawbacks of high cost, long time for detection processes and complex procedure. So the direct detection of insulin by electrochemical techniques has already achieved considerable attention due to their intrinsic benefits of high sensitivity, low cost, portability, simplicity and etc.

Cellulose nanocrystals (CNCs), as one of the widely used new nanomaterials, have been used for fabrication of electrochemical sensors recently.

In the present work, for the first time, antifouling properties of CNCs toward the oxidation of insulin were reported. CNCs were synthesized from filter paper acid-catalyzed hydrolysis. In the present work CNCs and nanocomposite of CNCs-Nickel oxide Nanoparticles (NiO_xNP) were synthesized and characterized using microscopy and electrochemical techniques. Cyclic voltammetry and hydrodynamic amperometry were used to investigate the analytical characteristics of the CNCs modified glassy carbon electrode (CNCs/GCE) and CNCs-NiO_xNP/GCE toward the oxidation of insulin in physiological PH. While the electrooxidation of insulin on the bare GCE led to the deactivation of the surface after a short period of time, the CNCs/GCE and CNCs-NiO_xNP/GCE revealed highly stable insulin oxidation current. The effect of various experimental parameters on the electrochemical oxidation of insulin on the surface of proposed modified electrodes investigated using electrochemical techniques. Under optimum conditions very good analytical performances including; low detection limits, high stability, high sensitivity and wide linear range.

Keywords: Cellulose nanocrystal, Insulin detection, Modified electrode, Amperometry.

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PS237

MWCNTs modified glassy carbon electrode for sensitive determination of antiparkinson drug entacapone in the bulk, pharmaceutical and human blood

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ABSTRACT

The voltammetric properties of entacapone, an anti-Parkinson's disease drug, were investigated by cyclic voltammetry and differential pulse voltammetry using MWCNTs modified glassy carbon electrode in Britton–Robinson buffer in presence of Tween 20 and validated for quantitative determination of entacapone in bulk, pharmaceutical dosage forms and human plasma. Several factors such as pH, type of surfactant and scan rate were investigated in order to study the optimum conditions for determination of entacapone. A good linear relationship was obtained within the concentration range from 50×10^{-8} to 2.2×10^{-3}M. The limits of detection and limit of quantification were found to be $8\times10^{-9}$and 2.4×10^{-8}molL^{-1}, respectively. The proposed method was simple, rapid and economic, so it is suitable for routine analysis of entacapone in pure form and dosage forms and for pharmaco kinetic studies.

Keywords: entacapone, MWCNTs, cyclic voltammetry, differential pulse voltammetry

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PS238

Selective simultaneous determination of epinephrine and acetaminophen in presence of ascorbic acid using novel carbon paste electrode modified with TiO_2 hollow spheres, multi-walled carbon nanotubes and poly-glutamic acid film

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ABSTRACT

Acetaminophen (ACT) is widely used as a pain reliever and a fever reducer[1]. Epinephrine (EPI) is a hormone and plays important roles as a neurotransmitter. ACT acts by reducing cyclo-oxygenase products preferentially in the central nervous system, where oxidant stress is extremely limited. The stimulatory influence of ACT on cyclo-oxygenase activity in intact cells was abolished in the presence of electron-donating co-factor EPI [2]. Normally human use ascorbic acid (AA) in food dietary or medicine and then AA could be present in human blood or urine. Therefore, it would be potentially useful to study simultaneous determination of EPI and ACT in the presence of AA.

In this work the electrooxidation and electrochemical behavior of epinephrine (EPI) and acetaminophen (ACT) in presence of ascorbic acid (AA) has been investigated using the novel carbon paste electrode modified with TiO_2 hollow spheres (TOHS), multi-walled carbon nanotubes (MWCNTs) and poly-glutamic acid (PGA) film (PGA/TOHS/MWCNTs/CPE). Cyclic voltammetry (CV), differential pulse voltammetry (DPV) and chronoamperometry (CA) methods were used for electrochemical investigations. The sensor showed high sensitivity toward electrochemical oxidations of EPI and ACT. PGA on the modified electrode at applied pH of 7 has negative charge lead to decrease interference of AA during measurements of EPI and ACT. At optimum conditions, linear ranges of 0.04–80 and 0.08–75 µM with corresponding detection limit of 28.9nM and 63.4nM (S/N=3) for EPI and ACT respectively were obtained using DPV method. The sensor was used successfully for determinations of EPI and ACT in spiked human urine sample.

Keywords: Epinephrine, Acetaminophen, TiO_2 hollow spheres, Multi-walled carbon nanotubes, Poly-glutamic acid.

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PS239

Hydrogen peroxide biosensor based on the immobilization of horseradish peroxidaseby covalent bond to modified carbon nanotube

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ABSTRACT

Fast and easy determination andmeasurment of hydrogen peroxide (H_2O_2) is ofpractical importance in clinical, pharmaceutical, biochemical, environmental. [1,2]. Among all of measurement methods, the electroanalytical method is advantageous over other methods because of low-cost and ease of operation. The sensitive determination of H_2O_2 can be achieved with the use of peroxidase enzyme-modified electrodes, since the enzymes possess excellent selectivity and high sensitivity [3].

In this studyhorseradish peroxidase enzyme(HRP) was immobilized by covalent bondingbetweenamino group of the HRP and carboxylic acid group of modified carbon nanotube on a glassy carbon (GC) and its applicationas a biosensor for H_2O_2, were investigated by using electrochemical methods.The effects of experimental variables such as pH of supporting electrolyte solution and applied potentials for the working electrode were investigated for the optimized conditions. The biosensor had a wide linear response range from 4.1µM to 50mM H_2O_2 with a detection limit of 3.2 µM (S/N=3) and an apparent Michaelis -Menten constant (K_M) of 1.96mM.This value is lower than those of 17.89 mM for HRP immobilized in carbon nanotubes-polyethyleneiminenano-composite film [4] and 11.94 mM for HRP entrapped in graphene and dsDNA composite modified carbon ionic liquid electrode [5].

Keywords: Hydrogen peroxide, Horseradish peroxidase enzyme, Michaelis-Menten constant.

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PS240

Preparation of modified carbon based electrode with CdO nanoparticle and ionic liquid for voltammetric determination vanillin

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ABSTRACT

Vanillin is a unique food additives with high nutritional value[1]. In this work a sensitive voltammetric method has been developed for the determination of vanillin in food sampeal. The electrochemical behavior of the vanillin at this modified electrode was studied by cyclic voltammetry and square wave voltammetry. The proposed sensor showed a limit of detection detection of 9.0 nM and linear range of 0.03-800.0 µM for analysis of vanillin square wave voltammetric method. The proposed modified electrode was successfully applied for the determination of curcumin in food samples.

Keywords: Vanillin, CdO nanoparticle, Ionic liquid

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PS241

Using Poly (3, 4-ethylenedioxythiophene) and carbon nanotube for the fabrication of laccase biosensor to detect phenolic compounds

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ABSTRACT

Biosensors research is a rapid growing field in which tens of thousands of papers have been published over the years; even more numerous biosensors have been developed for detection of biomolecules among them the phenolic compounds [1]. There are several interesting features in the biosensors making us select them as monitoring tools such as simplicity, accuracy, reliability and reasonable cost determination of different analysts as well as they operate as an effective analytical tool in the quality control of food, high sensitivity and selectivity [2,3]. In such, catechol which reacts with appropriate enzymatic bioreceptor like laccase. A novel electrochemical biosensing electrode for the determination of catechol was investigated by covalent immobilization of laccase on a glassy carbon electrode modified by conducting polymer built of Poly (3, 4-ethylenedioxythiophene), gold nanoparticles, and carbon nanotube. The fabrication process of the sensing surface was characterized by scanning electron microscopy (SEM), Fourier transform infrared spectroscopy, cyclic voltammetry. The electrochemical results showed that laccase was immobilized onto modified glassy carbon electrode by the covalent interaction between laccase and terminal functional groups of the carbon nanotube. The laccase immobilized modified electrode showed a direct electron transfer reaction between laccase and the electrode. Under optimum conditions, the biosensor showed a linear response in the range of 0.1-0.8 µM. The limit of detection was calculated to be 0.27 µM with a correlation coefficient of 0.9 and the sensitivity was 7.67 A L mol^{-1}.

Keywords: Biosensor; CNT; Laccase; Phenolic compounds

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PS242

Fabrication of nanostructure electrochemical sensor for voltammetric determination of benserazide

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ABSTRACT

Benserazide is used with levodopa for treatment of Parkinson's disease [1-2]. We describe a novel benserazide voltammetric sensor, comprising carbon-paste electrode (CPE) modified with NiO nanoparticle and ionic liquid as binder. NiO nanoparticle was synthesized by direct chemical precipitation method and characterized with scanning electron microscopy (SEM) and X-ray powder diffraction (XRD) methods. The developed voltammetric sensor displays good catalytic activity toward oxidation of Benserazide, which occurs by good electrochemical conductivity of ionic liquid and nanoparticles.The suggested system detects Benserazide over the range of 0.05–450 μM, with a detection limit of 0.02 μM. The elecrode modified was successfully applied to the determination of Benserazide in pharmaceutical samples.

Keywords: Benserazide, NiO nanoparticle, Carbon-paste electrode

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PS243

Molecularly imprinted polymer-based sensors for amperometric determination of amoxicillin

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ABSTRACT

A novel molecularly imprinted polymer electrochemical sensor was developed for the sensitive and selective determination of amoxicillin (AMO). The sensor was prepared on a carbon paste electrode modified with polyaniline as molecularly imprinted polymers (MIPs). Polyaniline was introduced to enhance the sensor's electronic transmission and sensitivity [1]. The molecularly imprinted polymer (MIP) was synthesized using AMO as the template molecule, aniline as monomer, and Tiphenylamine and Graphene as cross-linkers [2, 3]. The performance of the prepared imprinted sensor was investigated using cyclic voltammetry (CV). The results showed that the molecular imprinted polymer displayed a fast response and sensitive to AMO. Under optimal conditions, response peak current had a linear relationship with the concentration of AMO in the range of 5 to 40 ppm. Linear regression of current on concentration gave the regression equation Y=1.2C+0.0644, where C is the concentration in ppm and Y is the current with a correlation co-efficient of r = 0.9946. The detection limit was obtained 2ppm for amoxicillin. The sensors response was very fast and selective for the corresponding template.

Keywords: Amperometric sensor, Amoxicillin, Molecularly imprinted polymer

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PS244

A high performance nonenzymatic electrochemical glucose sensor based on screen-printed electrodes modified with silver/porous silicon nanocomposite

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ABSTRACT

A novel nonenzymatic amperometric glucose sensor based on screen printed electrodes (SPEs) modified with silver/porous silicon nanocomposite has been developed. silver porous silicon (Ag/PSi) nanocomposite powder is a new material synthesized by electroless deposition of silver nanoparticles on the etched PSi powder in a solution containing hydrofluoric acid and $AgNO_3$ [1,2]. The components and morphological properties of Ag/PSi nanocomposites were investigated by means of scanning electron microscopy, X-ray diffraction spectroscopy, energy dispersive X-ray spectroscopy, X-ray photoemission spectroscopy and FT-IR. The proposed amperometric sensor exhibited no interference from common interferences such as ascorbic acid, dopamine, uric acid, fructose and citric acid. High electrocatalytic activity towards the oxidation of glucose was observed with a rapid response (<3s), a low detection limit (0.2 µM), a wide and useful linear range (1 µM -7.7 mM) as well as good stability and repeatability. Additionally, its application for detecting glucose concentration of human serum sample showed good agreement with the results obtained from automatic biochemical analyzer.

Keywords: Porous silicon, Nanocomposite; Glucose detection; Non-enzymatic sensor; Amperometry

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PS245

Improvement of an electrochemical aptasensor using MWCNT/CQD for the ultrasensitive detection of lysozyme

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Abstract

A high sensitive and selective aptasensor based on a nanocomposite of multiwalled carbon nanotubes (MWCNT), poly diallyldimethylammonium chloride (PDDA) and a synthesized carbon quantum dot (CQD) on the surface of a glassy carbon electrode (GCE) was developed for lysozyme detection. For the surface characterization of unmodified GCE, MWCNTS/PDDA/CQD modified GCE as well as the interaction between lysozyme and aptamer, the electrochemical techniques were used, including differential pulse voltammetry (DPV), cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). In the aptasensor, the aptamer on the adsorbent layer catches the target on the electrode interface in the presence of lysozyme. This process makes a barrier for electrons and inhibits electron transfer, thereby resulting in decreased DPV signals of the MWCNTS/PDDA/CQD modified GCE. In addition, the proposed aptasensor has a very low LOD of 12.9 fmol L^{-1} lysozyme within the detection range of 50fmol L^{-1}- 10 nmol L^{-1} The aptasensor also shows high reproducibility, sensitivity, rapidity and specificity for lysozyme, which is unaffected by the coexistence of other proteins[1-3].

Keywords: Aptamer; Lysozyme; Multiwall carbon nanotubes; Carbon quantum dot.

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PS246

NiO nanoparticles ionic liquid modified carbon paste electrode as a sensor for analysis of doxorubicin as an anticancer drug

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ABSTRACT

Doxorubicin is a chemotherapy medication used to treat cancer [1]. In this study, NiO nanoparticles was synthesized by chemical precipitation method and characterized with TEM and XRD methods with diameter of 11 nm. In continuous, carbon paste electrode modified with NiO nanoparticles and ionic liquid was fabricated and used for analysis of doxorubicin. The RSD% for 5 replicates determination of 15.0 µM and 30.0 µM of doxorubicin were 1.9% and 2.7%, respectively. The proposed sensor showed a limit of detection ~ 15 nM. The proposed sensor was also examined for the determination of doxorubicin in real samples.

Keywords: Doxorubicin, NiO nanoparticles, Carbon paste electrode

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PS247

Construction of an electrochemical aptasensor based on titanium oxide nanoparticles - silk fibroin composite and gold nanoparticles for detection of prostate specific antigen (PSA)

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ABSTRACT

Prostate cancer is one of the commoncancer among men that leading cause of cancer mortality in men [1]. A danger zone of total PSA level in blood is higher than 4 ng mL^{-1} [2] or 10 ng mL^{-1}[3], so detection of lower levels of PSA is vital. In the present work, a novel electrochemical aptasensor for detection of prostate cancer indicator (PSA) was designed using glassy carbon electrode (GCE) modified with composite of titanium oxide nano particles (TiO_2) - silk fibroin nano fibers (SF) and gold nano particles. The fabrication processes of electrochemical aptasensor were characterized by cyclic voltametery (CV) and electrochemical impedance spectroscopy (EIS) in aqueous solution. After optimization of experimental conditions, the designed aptasensor (MCH/Apta/AuNPs/SF/TiO_2/GCE) revealed two linear ranges contain of1.0×10^{-6} M to 1.0×10^{-12}M and 1.0×10^{-13} M - 1.0×10^{-16}M and detection limit of 3.3×10^{-17} M for detection of PSA by impedance technique. Also, the MCH/Apta/AuNPs/SF/TiO_2/GCE aptasensor indicated high selectivity towards detection of PSA as a main target compared with other various targets such as BSA, I_m, I_g and lysozyme.

Keywords: Aptasensor, Prostate specific antigen (PSA), Titanium oxide (TiO2), Silk fibroin (SF) composite

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PS248

Simultenous voltammetric determination of guanine and adenin in DNA using Zn/MWCNT nanocomposite modified electrode

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ABSTRACT

In this study, we have introduced a modified glassy carbon electrode (GCE) with zinc-filled multi-wall carbon nanotubes (Zn/MWCNTs) for voltammetric investigation of guanine (G) and adenine (A) in DNA. The electrode has been prepared by dispersing of Zn/MWCNTs in dimethylformamide (DMF). The uniform and stable suspension was achieved by ultrasonication treatment. Then, Zn/MWCNTs-GC electrode was fabricated by evaporation of DMF solvent. Field emission scanning electron microscopy (FE-SEM) and electrochemical impedance spectroscopy (EIS) as powerful tools have been used for measuring surface topography and analyzing electrochemical properties of the modified electrode, respectively. Then, the electrode was applied for determination of A and G by cyclic voltammetry (CV) and square wave voltammetry (SWV) in acetate buffer solution as a suitable supporting electrolyte (pH from 2 to 7.6) showed a reversible redox peaks that are dependent on pH.

Under optimal conditions, the oxidation peak currents of G and A at pH 3.7 was linearly proportional to the related concentration. The linear range of 0.02-4 µM and 0.05-9 µM with a detection limit of 5.7 nM and 9.2 nM (RSD<5%) was obtained for G and A respectively after 5 min of accumulate time by SWV. This sensor is suitable for the analysis of the trace amounts of A and G in fish sperm DNA sample.

Keywords: Guanine; Adenine; Square wave voltammetry (SWV); Zn/MWCNT

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PS249

Preconcentration of Cu^{2+} ions using ultrasound-assisted dispersive liquid–liquid micro extraction (US-DLLME) using their determination using differential pulse voltammetry in cereal samples.

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ABSTRACT

Copper is an essential element not only for mammals but also for plants, and plays an important role in carbohydrate and lipid metabolism. It has many biological effects as an essential element as well as a toxic one. A new, simple, rapid, low environmental toxicity and sensitive ultrasound-assisted dispersive liquid–liquid micro extraction (US -DLLME) procedure was developed for the preconcentration of Cu^{2+} ions, and their determination using differential pulse voltammetry. Sodium diethyl dithio carbamate (NaDDTC) was used as chelating agent prior to extraction. The influence factors relevant to DLLME, such as type and volume of extractant and ultrasonic and centrifuge time, concentration of chelating reagents, pH, and salt effect, were optimized. Under optimized conditions, the presented method showed good linearity in the range of 0.5–50ng mL^{-1}, with determination coefficients higher than 0.996. The detection limits of the method were 0.1ng/mL and the relative standard deviations (R.S.Ds.) for five determinations were 2.3% . The interferences of some common ions were studied. This method has been also successfully applied to analyze the cereal samples at two different spiked concentrations and excellent results were obtained.

Keywords: Dispersive liquid–liquid micro extraction, Copper (II), Differential pulse voltammetry

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PS250

Simultaneous determination of dopamine, acetaminophen and xanthineby modified micro-carbon ceramic electrode with nano-sized $LaFe_{0.2}Ni_{0.8}O_3$ perovskite

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ABSTRACT

Dopamine (DA) is one of the excitatory neurotransmitters in mammalian central nervous system that play an important role in the function of central nervous, renal, hormonal and cardiovascular systems [1]. Low concentrations of DA may cause neurological disorders such as schizophrenia and Parkinson's disease [2]. Acetaminophen (AC) is extensively used to prevent or reduce fever and pain drug, it has low perniciousness when used at recommended doses [3]. AC is of application for the sedation of postoperative pain as well as mild to moderate pain associated with headache, lumbago and arthritis.Xanthine (XN) is a purine base found in most human body tissues and fluids and in other organismsis. The concentration amount of XN in biological fluids may put out sensitive indicators of specific pathologic states, especially for xanthinuria. It is a scarce genetic disorder where the lack of xanthine oxidase leads to great concentration of XN in body fluids and can cause health problems such as renal failure [4]. Theoretically, these compounds, DA, AC, and XN co-exist in real biological fluids blood. A modified micro-carbon ceramic electrode (CCE) with nano-sized $LaFe_{0.2}Ni_{0.8}O_3$Perovskite**has** developed for simultaneous determination of DA, AC) and XN. The electrochemical response characteristics of the modified CCE toward DA, AC and XN were investigated by cyclic voltammetry, differential pulse voltammetry and chronoamperometry. pH and interference effects were studied. Under the optimum conditions, linear calibration plot is obtained over the range 6.7-180, 10.0 -536 and 3.7-243 µM with detection limits 2.1, 3.2 and 1.2 µM for DA, AC and XN, Respectively. The value of D was found to be 9×10^{-6}, 6.3×10^{-5} and 4.8×10^{-4} $cm^2\ s^{-1}$ for DA, AC and XN, respectively. The analytical performance of this sensor has been evaluated for simultaneous detection for three analysts in human serum samples.

Keywords: Simultaneous determination, Micro-carbon ceramic electrode, Perovskite $LaFe_{0.2}Ni_{0.8}O_3$.

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PS251

Magnetic Fe_3O_4@NiO core/shell nanoparticles modified carbon paste electrode for simultaneous determination of quercetin and tryptophan

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ABSTRAC

Current study related to fabrication of a new sensitive electrochemical sensing based on uniform three–dimensional (3D) flowerlike Fe_3O_4@NiO magnetic nanoparticles (MNPs) modified carbon paste electrode (Fe_3O_4@NiO/ CPE) for simultaneous determination of quercetin (Q) and tryptophan (Trp). Fe_3O_4@NiO with the size of the hierarchical microspheres of 70–80 nm and the shell with of several nano flakes with a thickness of 10–20 nm were prepared.The sensor done by field emission scanning electron microscopy (FESEM), X–ray diffraction (XRD), vibrating sample magnetometer (VSM) and voltammetry techniques. Under optimum conditions the electrode provides linear responses for Q and Trp concentration in the wide ranges of 0.08–60 and 0.1–120 μM for Q and Trp, respectively. This sensor exhibited excellent stability, selectivity, sensitivity and good reproducibility of the modified electrode suggested that sensor successfully applied for simultaneous determination of Q and Trp in human breast milk, honey and cow milk with an excellent recoveries and without the interferences of coexisting substances.

Keywords: Fe_3O_4@NiO core/shell, Magnetic nanoparticles, Carbon paste electrode, Quercetin, Tryptophan.

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PS252

Antimony trioxide modified carbon nanotube paste electrode for square wave anodic stripping voltammetric measurement of copper ion

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ABSTRACT

Heavy metal ions are the hazardous pollutants in the environment around us [1]. Someelectrochemical methods have been applied to determine metal ions [2].
In this study, an antimony trioxide modified multi-walled carbon nanotube paste electrode(Sb_2O_3/CNTPE) was employed for square wave anodic stripping voltammetric measurement(SWASV) of Cu2+ ions. We used 8-hydroxy-7-iodo-5-quinoline sulfonic acid (HIQSA) as achelating agent [3]. For estimating the morphology and properties of the modified electrode,the field emission-scanning electron microscopy (FESEM), energy dispersive spectroscopy(EDS) and electrochemical impedance spectroscopy (EIS) methods were applied. SWASVmeasurements were done in 0.6 M HCl at -1.0 V vs. Ag|AgCl|KCl (3 M) for 90 s as depositionstep. After equilibrium time of 15 s, an SWASV appeared at 0.0 V vs. Ag|AgCl|KCl (3 M) asstripping step. The Sb_2O_3/CNTPE revealed a good linear operation in the examinedconcentration range of 2-100 ppb Cu^{2+} with appropriate detection limit about 0.39 ppb andlimit of quantification about 1.3 ppb. The stability of the modified electrode during 7 weeksand its behavior in the presence of some metal ions were evaluated. Finally, the method wassuccessfully tested via measuring Cu2+ in tap water.

Keywords: Antimony trioxide; Anodic stripping analysis; Carbon nanotube paste electrode; Cu2+ ion

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PS253

A sensitive and low toxicity electrochemical environment-friendly sensor for mesalazine based on the nanocomposite of carbon dots, hexadecyltrimethyl ammonium bromide and chitosan

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ABSTRACT

A novel, sensitive and selective electrochemical sensor for mesalazine (MSA) [1]was developed based on the nanocomposite of carbon dots (CDs)[2,3]and CTAB through electrostatic self-assembly and fixed by chitosan. This CDs-CTAB-CS electrode system explored the great potential applications of CDs for electrochemical sensors, representing a new platform for designing low toxicity and environment-friendly electrochemical sensors. The prepared electrode showed excellent electrocatalytic properties against the oxidation of MSA. The CS/CDs-CTAB/GCE was used as an amperometric sensor in an electrochemical cell, and the working potential was fixed at 0.70 V. The catalytic oxidation peak current varied linearly with the concentration of MSA in the range of 0.1 µM to 10 µM with a limit of detection 0.05 µM. The current response toward MSA was quite stable and reproducible, so the electrochemical sensor could be applied to the analysis of real samples, successfully.

Keywords: Carbon dots, Mesalazine, Electrochemical sensor, Environment-friendly sensor

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PS254

Highly sensitive simultaneous detection of sulfasalazine and mesalazine using cyclodextrin/reduced graphene oxide/glassy carbon electrode

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ABSTRACT

Sulfasalazine (SSZ) and Mesalazine (5-aminosalicylic acid, 5-ASA) belong to an important class of medications called anti-inflammatories drugs which are extensively used for controlling active ulcerative colitis or Crohn’s disease. SSZ is delayed release formulation of 5-ASA which is released in the terminal ileum and metabolized to sulphapridine and 5-ASA by the bacterial reduction of azo band [1]. In this work, we used a single step electro-polymerization method for simultaneous immobilization of β-cyclodextrin (β-CD) and reduced graphene (rGO) on the glassy carbon electrode by cyclic voltammetry from rGO, β-CD and phosphate buffer solution [2]. The electrode can simultaneously possess the properties of the individual constituent materials, such as the supramolecular recognition and enrichment capability of β-CD and the large surface area and high conductivity of rGO [3]. The electrochemical properties of this polymer were characterized by scaning electron microscopy (SEM) and electrochemical impedance spectroscopy (EIS). The optimization of the electropolymerizatin cycles, the pH of supporting electrolyte, accumulation time and voltammetry parameters were investigated and Under optimal conditions, the modified electrode exhibits remarkable enhancement effects on the oxidation peak currents of SSZ and 5-ASA. The linear calibration curves were obtained within range of 0.01-13.5 µM and 0.2-12.0 µM, and detection limits down to 2.5 nM and 7.4 nM for 5-ASA and SSZ, respectively. The modified electrode showed excellent sensitivity, selectivity, long-term stability and remarkable reproducibility. This analytical method was succesfully developed for hight sensitive and selective simultaneous determination of SSZ and, 5-ASA, in bilogical samples.

Keywords: β-cyclodextrin**,** Reduced-graphene oxid, Sulfasalazine, Mesalazine, Metabolite

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PS255

A sensitive simultaneous determination norepinephrine and tyrosin in the presence of ascorbic acid using a glassy carbon electrode modified with a MCM-48-SO_3H NP/ multiwalled carbon nanotubes nanocomposite

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Abstract

A chemically modified electrode is constructed based on a multiwalled carbon nanotubes (MWCNTs) and Mesoporous (MCM-48-SO3H NP)[1] composite modified glassy carbon electrode (MWCNTs- MCM-48-SO3H NP/GCE).. It is demonstrated that the sensor can be used for the simultaneous determination of norepinephrine (NE)[2], tyrosin (Tyr)[3] in the presence of Ascorbic acid(AA). This composite accelerated the electron transfer reaction of NE and Tyr although sulfonic acid functional groups as negatively charged groups decrease the electrochemical response of AA. The measurements were carried out by the application of differential pulse voltammetry (DPV), cyclic voltammetry (CV) and chronoamperometry (CA) methods. Under the optimum conditions the electrode provides a linear response versus NE and Tyr concentrations in the range of 0.4-600µM and 0.9-500 µM, respectively using the DPV method. The modified electrode was used for determination of NE and Tyr in real samples with satisfactory results.

Keywords: Norepinephrine , Tyrosin, Ascorbic acid, Modified electrode, Multiwalled carbon nanotubes.

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PS256

Determination of streptomycin using molecularly imprinted polymer

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ABSTRACT

Firstly, streptomycin was isolated from soil bacterial and used as the first antibiotic remedy for tuberculosis. Also, it was used as the first class of drugs that called aminoglycosides [1]. Nowadays, it has been widely applied in the infective endocarditis, tuberculosis, plague, and veterinary medicine for the treatment of bacterial infection diseases [2]. Molecular imprinting is a process by which selected functional monomers are allowed to self-assemble around a template molecule and subsequently polymerized in the presence of a crosslinker [3]. Once the template molecules are extracted from the resulting polymers, the cavities complementary in shape and functionality are present in the matrix, which will bind molecules identical or closely related to the template [4]. In this work, a very sensitive electrochemical sensor based on imprinted polymer was applied to determine streptomycin. The sensor was prepared by incorporating of streptomycin as template molecules during the electropolymerization of 3-methyl-4-nitrophenol on glassy carbon electrode. To develop the molecularly imprinted polymer, the template molecules were removed from the electrode's surface by washing it with 0.20 mol/L NaOH solution. The imprinted layer was characterized by electrochemical impedance spectroscopy and atomic force microscopy (AFM). Cyclic voltammetryand differential pulse voltammetry were applied to investigate the electrochemical response of the streptomycin on the electrode surface. The electrode showed a linear response 0.11-0.58 and 0.58-5.23 ng/ml and a detection limit of 0.02 ng/ml under the optimized conditions. The effects of other antibiotics were studied on the determination of streptomycin and the results showed that the constructed sensor has good selectivity rather than streptomycin. Real samples such as biological and pharmaceutical samples were analyzed with the proposed sensor.

Keywords: Streptomycin, Molecularly imprinted polymer, Electrochemical determination

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PS257

Potentially-resolved electrochemiluminescence immunoassay for simultaneous determination of CEA and AFP tumor markers using dendritic nanoclusters and $Fe_3O_4@SiO_2$ nanoparticles

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ABSTRACT

The potentially-resolved electrochemiluminescence (ECL) immunoassay based on a dual signal amplification strategy was designed for the simultaneous determination of two different tumor markers, alpha-fetoprotein (AFP) and carcinoembryonic antigen (CEA) using polyamidoamine dendrimer - quantum dots (PAMAM –QDs) and PAMAM-luminol as the signal probes and Fe_3O_4-SiO_2 as a magnetic bead. CdTe@CdS and luminol at the presence of H_2O_2 as a co-reactant agent generate luminescence signals at -1.12 V and +0.6 V (vs Ag/AgCl), respectively. Using this methodology, AFP and CEA antigens were quantified through potential cycling from 0.6 to -1.4V. Experimental results illustrated that two tumor markers could be detected in a wide linear range from 0.25 fgmL^{-1} to 20 pgmL^{-1} with a very low detection limit of 0.10 fg mL^{-1} for both analysts. The application of the immunosensor for simultaneous detection of AFP and CEA in human serum as real sample was evaluated and the obtained results were in acceptable agreement with the reference values from ELISA method.

Keywords: Electrochemiluminescence, Simultaneous determination, Quantum dots, Dendrimer, Magnetic nanoparticles.

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PS258

Electrochemical determination of 5-flurouracile using modified nanostructure carbon paste electrode

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ABSTRACT

5-Flurouracile (5-FU) is an analogue of uracil that commonly used in the treatment of breast and colorectal cancers in the recent years [1]. Determination of this anticancer drug is very important in human body. In this research, isdescribed a $ZnFe_2O_4$ nanoparticle ionic liquid modified carbon paste electrode as a highly sensitive electrochemical sensor for 5-FU analysis in aqueous solution. $ZnFe_2O_4$ nanoparticle synthesized by co-precipitation method and characterized with TEM and XRD methods. An average diameter of as-synthesized $ZnFe_2O_4$/MNPs was calculated about 17.4 nm. The oxidation peak current of 5-FU showed linear dynamic range in the concentration range of 0.1–1400 µM with limit of detection 0.07 µM. The proposed sensor was used for analysis of 5-FU in tablet and urine samples.

Keywords: 5-Flurouracile, $ZnFe_2O_4$ nanoparticle, Sensor

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PS259

Application of modified voltammeric sensor with Pt/CNTs nano-composite and ionic liquid for analysis of 6-mercaptopurine drug

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ABSTRACT

6-Mercaptopurine (6-MP) is an important thiopurine anti-cancer drug with immunosuppressant properties for treatment of childhood acute lymphobalstic leukaeima [1] and inflammatory bowel disease [2]. Determination of this anticancer drug is very important in human body. In this research is fabricated an electrochemical sensor based on carbon paste electrode modified with Pt/CNTs and 1-butyl-3-methylimidazolium hexafluoro phosphate as a highy sensitive sensor in 6-MP analysis. Pt/CNTs synthesized with polyol method and characterized with TEM and XRD methods. The peak current for 6-MP was found to vary linearly with its concentration in the range of 0.05–550 µM with detection limits of 0.009 µM using square wave voltammetric method. The proposed sensor was used for analysis of 6-MP in tablet and urine samples.

Keywords: 6-Mercaptopurine, Pt/CNTs, 1-Butyl-3-methylimidazolium hexafluoro phosphate, Sensor

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PS260

A simple and sensitive graphene oxide modified biosensor for detection of E. Coli

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ABSTRACT

Detection of pathogen microorganisms, such as E. coli, which can be harmful for public health is so important [1]. In this study, tried to design a simple and sensitive biosensor based on synthesized graphene oxide (GO). E. coli ATCC25922 was sub-cultured in Nutrient agar medium and incubated at 37°C (fig.1.a). Synthesis of reduced graphene oxide was done according to Hammer method [2]. The SEM image (fig. 1.b) is shown the extensive and porous morphology of GO. 20 µL of GO suspension were spiked on the polished surface of glassy carbon electrode and dried at room temperature. Three different concentrations of E. coli suspension were prepared in accordance with 0.5, 1and 2 McFarland concentrations, which are equal to 1.5×108, 3.0×108 and 6.0×108 cfu.mL-1. As can be seen in the square wave voltammograms in fig. 2, current increased by increasing the concentration of E. coli suspension. The effective parameters like PBS pH, scan rate, GO concentration were optimized at 7.0, 0.1 V.s-1 and 1 mg.mL-1, respectively. The results of the study revealed that this modified biosensor can be used for comparing the effectiveness of some hygienic preservatives like benzyl alcohol, Euxyl and Lonza zero. By adding the preservatives into the E. coli growth media, the related currents were decreased. It means that the GO/GCE can detect the presence and absence of E. coli in a few minutes.

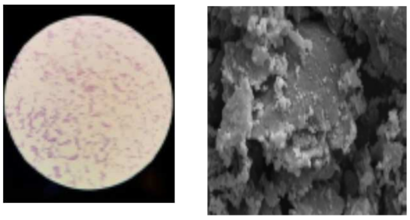

Fig. 1 a-Microscopic morphology of E. coli (×100), b-SEM image of synthesized GO.

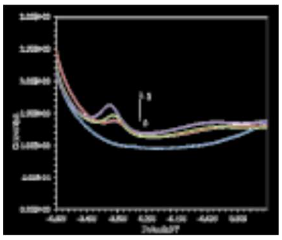

Fig. 2 SWVs of three different concentration of E. coli.

Keywords: Escherichia Coli, Reduced graphene oxide, Square wave voltammetry

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PS261

Glassy carbon electrodes modified with carbon nanostructures: application to sensitive voltammetric determination of nifedipine

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ABSTRACT

Nifedipine (NIF), a calcium channel blocker belonging to the dihydropyridine family, has commonly been used as a potent arterial vasodilator in the management of angina and cardiovascular diseases [1] . It is important to develop a simple, rapid and low-cost electrochemical method for the detection and quantification of NIF in physiological media for academic research and clinic applications. Carbon nanomaterials (CNMs) frequently display unusual physical and chemical properties, depending upon their size, shape, and stabilizing agents. CNMs have attracted considerable attention as promisingn electrode materials for sensing applications because of their unique and novel properties such as high surface area, high electrical conductivity, strong mechanical strength and good chemical stability [2]. In this work, in order to determine NIF, various modifiedelectrodes were prepared by the GCE surface pre-coated with different CNMs, including carbon nanotubes (CNTs), carbon nanoparticles (CNPs), nano diamond/graphite mixture (NDG) and reduced graphene oxide (RGO). Cyclic voltammetry (CV) was used to study the electrochemical behavior of NIF on the surface of the prepared modified electrodes. The electrochemical studies indicated that the CNPs/GCE was shown good electrochemical response toward NIF redox reaction. Using selected modified electrode, CNPs/GCE, the reduction and oxidation mechanism of NIF was discussed in details. The effects f the experimental variables, such as the deposited amount of CNPs suspension, the pH of the supporting electrolyte, the accumulation time, as well as the potential scan rate are investigated. Under the optimal experimental conditions, the reduction peak current was proportional to NIF concentration in the range of 0.01 – 1.5 µM. The detection limit was 3 nM. This sensor showed several advantages such as simple preparation method, high stability and uniformity in the composite film and good reproducibility. The modified electrode was successfully applied for the accurate determination of trace amounts of NIF in pharmaceutical and clinical preparations.

Keywords: Carbon nanostructures, Modified electrodes, Nifedipine, Cyclic voltammetry

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PS262

Determination of cobalt(II) with 1-(2-Pyridylazo)-2-naphthol modified carbon nano tube paste electrode in electrowinning solution of Sarcheshmeh-copper complex by stripping voltammetry

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ABSTRACT

A method for the determination of cobalt(II) by stripping voltammetry using a carbon paste electrode constructed by incorporating 1-(2-pyridylazo)-2-naphthol(PAN) into a conventional carbon paste mixture composed of nano tube, graphite powder and Nujol oil has been developed. Several influencing factors for the determination of cobalt(II) were studied in detail and the optimum analytical conditions were found to be as follows: pH 2.5; composition of electrode, 20% and time of preconcentration 3 min. The calibration curve for cobalt(II) obtained by stripping voltammetry was linear range of 0.2-6.7 ppb. The effects of coexisting ions were also investigated to test the applicability of the proposed method to the determination of cobalt(II) in electrowinning solution of Sarcheshmeh-copper complex sampels.

Keywords: Cobalt(II) , Electrowinning, Sarcheshmeh-copper complex, Stripping voltammetry

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PS263

Preparation of aptameric sensor, based on chitosan/ionic liquid/functionalized multi-walled carbon nanotubes nanocomposite to detect epirubicin

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ABSTRACT

The present work explains the fabrication of a novel electrochemical aptasensor for identifying the epirubicin. To evaluate the willingness of aptamer to interaction with Epirubicin (Epi) in the presence of complementary strand DNA, competitive binding assay between complementary strand of aptamer and Epi were used. Epi has been widely used to treat a diversity of tumors. But like other anthracyclines its clinical utilization is limited. Because of the high toxicity, as cumulative dose-related cardiotoxicity and myelosuppression (1, 2). Therefore, there is an emergent need for rapid, easy, selective and sensitive techniques for detection of Epi. The aptasensor prepared by immobilizing the thiolated aptamer on the surface of graphite screen-printed electrode modified with gold nanoparticles/functionalized multiwall carbon nanotubes/ ionic liquid / chitosan nanocomposite. Through the control experiments, we examined the response of fabricated aptasensor for some anticancer drugs. The results showed that using the thiol terminated aptamer led to a sensor with high tendency for Epi compared to other anticancer drugs.

Keywords: Aptasensor, Competitive binding assay, Epirubicin, nanocomposite.

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PS264

Study of nickel-palladium modified electrode for electrocatalytic oxidation of formic acid

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ABSTRACT

Application of modified electrodes using heavy metal alloy for years has been of interest to researchers [1-3]. In this work, the electrodes modified with different percentage of catalyst, Nickel-Palladium by electrodeposition for use as the anode in fuel cells in oxidation of formic acid was prepared in alkaline conditions. The prepared electrocatalysts for oxidation of formic acid were used in alkaline solutions. The Nickel-Palladium alloys electrodeposited on pencil electrode using chronoamperometric technique. The NaOH 1 M was used as a supporting electrolyte. The concentration of 0.01, 0.03, 0.06, 0.08 and 0.1 M of formic acid was added to the electrolyte. The peak current was linear in the range of 0.01 to 0.1 M of formic acid concentrations, using DPV techniques. The limit of detection (LOD) and the limit of quantification (LOQ) using a calibration curve based on the IUPAC definition of these two parameters were calculated and the 0.047 and 0.14 M respectively were obtained.Relative standard deviation (RSD) for formic acid, 1.8 percent obtained.The stability of prepared electrode was tested in 30 days in presence of formic acid; the experimental results showed that the response of modified electrode did not changed significantly at that time.

Keywords: Nickel-Palladium alloys, Oxidation of formic acid, Fuel cell anode

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PS265

Study of electrochemical behavior of alanine aminoacid using modified pencil graphite electrode and application of this electrode for real sample analysis

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ABSTRACT

Using transition metals and oxides of that metals as a modifier have been focused by scientists in recent years [3-1]. In this work, an attempt was made out of rose petals to produce carbon nanoparticles, after stabilizing carbon nanoparticles on the pencil electrode, various metals were deposited on it. Different techniques are used to modified the electrode surfaces. Experimental data showed that zinc (Zn) can be electrodeposited well on carbon nanoparticles on the electrodes. In this study, electrochemical oxidation of the amino acid alanine on pencil modified electrode with zinc using cyclic voltammetric techniques and potential range of -0.5 to 1.2 volts with scan rate 50 mV s^{-1} in 0.1 M sulfuric acid electrolyte was studied. The optimum conditions for electrooxidation of alanine amino acid such as the type of supporting electrolyte, the electrolyte concentration and activation method was investigated. Stability of modified electrode was studied within a month of the electrode was studied; the modified electrode showed good stability. According to the calibration curve obtained by cyclic voltammetric technique, the detection limit of the method was 0.015 M for modified electrode. Finally, this electrode was applied to determination of alanine amino acid in soy real samples. Relative standard deviation (RSD) for real sample, 0.66 percent obtained.

Keywords: Voltammetry cycle, Amino acid alanine, Electrodes pencil

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PS266

CuO nanoparticles/polypyrrole pencil graphite electrode as a highly sensitive sensor for sulfamethizole analysis

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ABSTRACT

Sulfamethizole is a sulfonamide antibacterial and used for treatment of infections in humans [1]. Therefore, determination of this drug is very important in pharmaceutical and biological samples. In this study, we synthesized CuO nanoparticle by chemical precipitation method and characterized with TEM and XRD method. In continuous, a pencil graphite electrode modified with CuO nanoparticles/polypyrrole was fabricated as an electrochemical sensor for sulfamethizole analysis. The proposed sensor showed a limit of detection ~ 0.03 µM for analysis of sulfamethizoleby square wave voltammetric method. The RSD% for 10 replicates determination of 10.0 µM and 20.0 µM of sulfamethizole were 1.6% and 2.2%, respectively. The proposed sensor was also examined for the determination of sulfamethizole in real samples.

Keywords: Sulfamethizole, CuO nanoparticle, Polypyrrole

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PS267

A facile electrochemical synthesis of $CuFeO_4$ nanoporous microsphere for high performance supercapacitor applications

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ABSTRACT

Electrochemical energy storage devices comprising batteries, fuel cells and supercapacitors play an important practical role in future energy applications. This is due to the growing demand for renewable clean energies with discrete nature. In this work, $CuFe_2O_4$ nanoporous microspheres have been synthesized by galvanostatic cathodic electrodeposition from mixed Fe/Cu nitrates. The effects of experimental parameters, including the time and charge density on the size and morphology of the obtained nanostructures were discussed. The synthesized nanostructures were characterized by X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM). Furthermore, the electrochemical properties of $CuFe_2O_4$ nanostructures were evaluated by cyclic voltammetry in 1M KOH aqueous solution at different scan rates. The hierarchical $CuFe_2O_4$ nanostructures showed the highest capacitance of 174.5 F/g at the scanning rate of 1 mv/s. The proposed method provides a facile, cost effective and high performance strategy for the synthesis of $CuFe_2O_4$ for supercapacitor applications.

Keywords: Electrochemical synthesis, Nanostructures, Super capacitors

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PS268

Selective electrochemical sensor based on graphene nanoplatelets modified platinum electrode for determination of sunset yellow as a food coloring

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ABSTRACT

Food coloring, or color additive, is any dye, pigment or substance that imparts color when it is added to food or drink. Food coloring is used both in commercial food production, domestic, pharmaceuticals and medical devices [1]. Sunset Yellow (SY) is a petroleum-derived orange azo dye used in food, soft drinks, cosmetics, and drugs. [2] For example, it is used in candy, desserts, snacks, sauces, and preserved fruits.

Graphene nanoplatelets (GNPs) represent a new class of carbon nanoparticles with multifunctional properties. GNPs are the stack of graphene sheets with an overall thickness of about 5 to 25 nm. They have “platelet” morphology with a diameter ranging from 0.5 to 25 μm, This unique size and platelet morphology makes these particles especially effective at providing barrier properties, while their pure graphitic composition makes them excellent electrical and thermal conductors [4,5], e.g.

In this study, a highly sensitive electrochemical sensor based on GNPs modified platinum electrode (Pt/GNPs) was fabricated for detection of SY in soft drinks based on the drop casting of GNPs suspension in DMF on the surface of Pt electrode. Cyclic voltammetry study of SY on the surface of Pt/GNPs shows a pair of peaks at 0.708 V and 0.625 V (vs. Ag/AgCl) in potassium hydrogen phthalate (pH 3.0, 0.1 M). The sensitivity of electrochemical sensor for detection of sunset yellow was increased by applying accumulation potential of 0.3 V for 40 s due to the adsorption of SY on the surface of electrode. Some parameters such as kind of supporting electrolyte, pH, volume of coated graphene nanoplatelets and scan rate have been optimized to get higher sensitivity. The fabricated electrochemical sensor was able to determine SY in soft drinks with recoveries more than 95% in spike samples.

Keywords: Graphene nanoplatelets, Platinum electrode, Electrochemical sensor, Sunset Yellow

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PS301

Interaction between Indole-3-acetic acid phytohormone and ds DNA by molecular spectroscopy and voltammetric techniques

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ABSTRACT

In this work, the interaction of indole-3-actic acid (IAA) (a plant growth hormone auxin) with salmon sperm DNA was investigated by different method such as: UV-Vis absorption, fluorescence spectroscopy, viscosity measurement and voltammetric methods. The experimental results displayed that the mode of binding of IAA to DNA duplex is intercalation. According to the thermodynamic parameters results (ΔG, ΔH, and ΔS), it is comprehended that the hydrogen bonds and van der Waals interactions also exist in the reaction. Ionic strength experiment showed the existence of electrostatic interaction as well. The results revealed the binding constant of IAA - DNA was 1.19×10^5 M^{-1}.

Keywords: Indole-3-acetic acid, Intercalation binding mode, Square wave voltammetry

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PS302

Electrodeposition of high pure silver crystals by electrorefining method: synthesis and optimization of effective parameters

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ABSTRACT

High purity of silver is one of the many important factors inmaterial science and industrial such as electronics industry and preparation of silver nitrate for the photographic industry.In silver electrorefining methodan impure silver metal isemploying as anode. After electrolysis purified silver crystals are deposited onto the cathode surface in an electrolytic cell.However, in this process silver ions are required as supporting electrolyte typically silver nitrate, which may be contain an increased concentration of impurities from previously dissolved anodes.In this work,electrodeposition of high pure silver crystals by electrorefining method investigated. The surface morphology and crystal structure of the electrorifined silvers were characterized by SEM, EDX and XRD respectively. The effective parameters and optimization of electrorefining process such as current density (5-50 mA/cm^2), concentration of electrolyte (0.1-2.0 M) and cathode materialare evaluated. In this process, we used of impure silver as anode and stainless steel or graphite as a cathode and $AgNO_3$ and HNO_3 as supporting electrolyte.The high pure silver crystals, according to the X-Ray diffraction pattern (XRD) obtained at the aqueous solution of $Ag^+$with concentration of 0.2 M and 0.25M nitric acid with the15mA/Cm^2 current densityand during of 60 min (Fig.1).

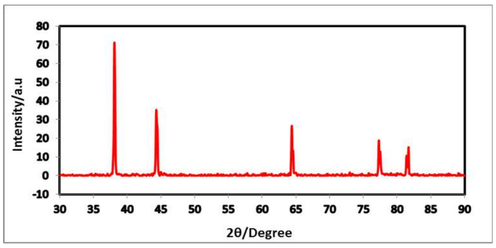

Fig. 1.The XRD pattern of high pure silver

Keywords: Electrodeposition, High pure silver crystal, Electrorefiningmethod

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PS303

Treatment of pollutants from restaurantwastewater by electrocoagulationtechnique

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ABSTRACT

Electrocoagulation (EC) is an effective electrochemical approach for the treatment of different variety of polluting water and has received considerable attention in recent years due its high efficiency in dealing with numerous persistent pollutants [1]. This method is especially more effective in treating wastewaters including small and light suspended particles, such as oily restaurant wastewater, because of the accompanying electro-flotation effect. Therefore, it is expected that the EC would be an ideal method for treating restaurant wastewaters. The purpose of this research is to examine the possibility of EC in treating restaurant wastewater and to determine the optimum operational situations. The specifications of restaurant wastewater were investigated. High oil and grease amounts were diagnosed [2]. In this work, effects of the electrode materials, primary contaminant concentration (primary COD between 5000-10000 mg/L), functional situations, current density (1-9 mA/cm^2), voltage and time of electrolysis (1-30 min) and primary pH of the wastewater (5-9) were examined. Two distinct electrodes, Al and Fe, are used for EC. The results described that treatment reduced chemical oxygen demand (COD) was almost 95% and the optimum time is between 10-15 min. The optimum charge loading and current density were wastewater and 2-4 mA/cm^2 belonging to the wastewater tested. According to the problem of water shortage in the country, use from low-cost method of treatment of restaurants wastewater can be effective for using in agriculture and etc.

Keywords*:* Electrocoagulation,Wastewater treatment, Restaurant, Pollutants

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PS304

Electrosynthesis of new phenoxazine derivatives of 1,5- diaminonaphthalene

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ABSTRACT

Electrosynthesis of main organic compounds has been extensively employed as a synthetic method in a variety of chemical transformations due to its unique properties such as eco-friendly nature, direct and short-cut synthetic route, high current efficiency values, high selectivity and sustainability of the reactions [1]. Phenoxazine is a heterocyclic compound that its structure consists of an oxazine fused to two benzene rings. In recent years, medicinal properties of phenoxazine derivatives have widely been investigated and were shown to be effective material as antitumor, antileukemia and antimicrobial [2]. 4-Amino-14*H*-dibenzo[a,h]phenoxazin-11-ol (Fig. 1) as a new phenoxazine derivative has been synthesized by a green one-pot method and structurally characterized by spectroscopic analysis. The electrochemical oxidation of 1,5- diaminonaphthalene (1,5-DAN) was studied and evidence for generation of naphthalene-1,5-diimine (1,5-DAN$_{ox}$) was obtained. Our data are also show that 1,5-DAN$_{ox}$can serve as a Michael acceptor in the reaction with starting molecular (1,5- DAN) and converts to 4-amino-14*H*-dibenzo[a,h]phenoxazin-11-ol. Spectroscopic characterization and voltammetry results have allowed us to propose *ECE* mechanism for the electrochemical oxidation pathway.

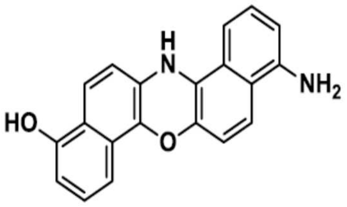

Figure 1. The structure of 4-amino-14*H*-dibenzo[a,h]phenoxazin-11-ol

Keywords: Electrosynthesis, Phenoxazine, 1,5-diaminonaphthalene

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PS305

Electrochemical study of 1,2-dimethoxybenzene

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ABSTRACT

Electrochemistry provides a very simple and practical tool for electrolysis, mechanical and kinetic studies . Furthermore cyclic voltammetry technique provides quantitative and qualitative information about the electrochemical mechanisms. It offers the potentiol of redox reactions, the number of electrons and conditions involved in the electrochemical process. An example of its use in chemistry is in the synthesis of domipizone. In this work, electrochemical oxidation of 1,2-dimethoxybenzene has been studied both in water and organic solvents. The oxidation of 1,2-dimethoxybenzene on glassy carbon electrode shows an irreversible feature in aqueous solution and also nonaqueous solvents. Cyclic voltammograms show an irreversible two-electron anodic peak at 1.2 V versus Ag\AgCl. The effect of potential scan rate, on the cyclic voltammetric response of 1,2-dimethoxybenzene in the anodic region, confirms the irreversibility of the oxidation process. On the other hand, the electrochemical behavior of 1,2-dimethoxybenzene has been studied in different pH values. The results confirm that proton(s) does not participate in the oxidation of 1,2-dimethoxybenzene while the redox reaction in catechol is two-electron/two-proton process involving the oxidation of catechol to corresponding *o*-benzoquinone.

1, 2-Dimethoxybenzene (veratrole)

Keywords: 1,2-Dimethoxybenzene, Electrochemical study, Catechol.

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PS306

symmetric functionalized bis(thiosemicarbazone) complex

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ABSTRACT

Earlier reports on N(4)-substituted thiosemicarbazones have concluded that the presence of bulky groups at the N(4) position of the thiosemicarbazone moiety greatly enhances biological activity [1]. The cytotoxic activities of such compounds can be correlated with their molecular electronic structures [2]. With this in our mind, one-electron reduction potential of Cu(II)/Cu(I) of copper complex with a symmetric 2-[1-(2-{3-[2-({2-[(4-chloroanilino)carbothioyl]hydrazono}-methyl)phenoxy]propoxy} phenyl)methylidene]-N^1-(4-chlorophenyl)-1-hydrazinecarbothiamide ligand (H_2L) was theoretically calculated by the density functional theory (DFT) B3LYP/6-31++G(d,p) level in dimethylformamide (DMF) solvent. The effects of solvation in DMF were incorporated as a self-consistent reaction field (SCRF) using the polarisable continuum model (PCM) and are found to be essential for quantitative agreement. The resulting estimate potential (E_{cal}) showed a very good agreement with the experimental potential (E_{exp}) derived from cyclic voltammetry.

Keywords: Bis(thiosemicarbazone), Copper, Cyclic voltammetry, DFT calculations

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PS307

An efficient electrochemical method for the synthesis of some thioether derivatives

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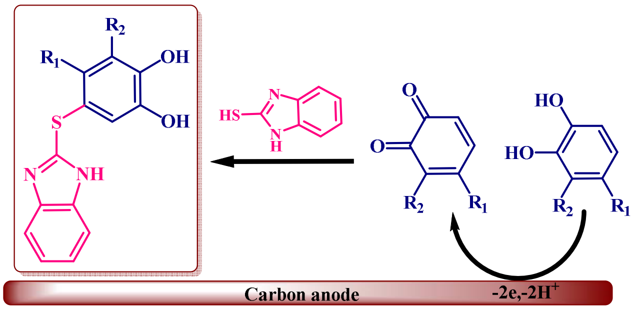
ABSTRACT

Electrochemical methods are more and more widely used for the study of electroactive compounds in pharmaceutical forms and physiological fluids due to their simple, rapid, and economical properties [1]. Investigation of catechol derivatives may lead to the discovery of selectively acting, biodegradable agrochemicals with a human, animal, and plant compatibility [2]. Thiols, as one of the intercellular reducing agents, generally protect biological systems against oxidative and inflammatory stress by serving as radical scavengers and/ or cofactors for intracellular enzymatic anti-oxidation functions [3]. In this study electrochemical synthesis of some thioether derivatives were carried out via the electrochemical oxidation of some diols such as catechol, 4-*tert*-butylcatechol and 3-methylcatechol in the presence of 2-mercaptobenzimidazole under green conditions. The results show that electrogenerated *o*-benzoquinone participates in the Michael addition reaction with 2-mercaptobenzimidazole and, via the *EC* mechanism converts to the corresponding thioether derivatives (Scheme 1).



Scheme 1

Keywords: Electrochemical synthesis, Michael addition, 2-Mercaptobenzimidazole.

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PS308

Electrochemical oxidation of hexamethylene-bis-urazole in the presence of azide

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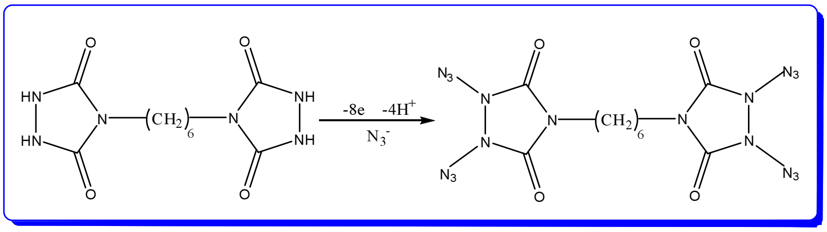
ABSTRACT

Electrochemical methods are more and more widely used for the study of electroactive compounds in pharmaceutical forms and physiological fluids due to their simple, rapid, and economical properties [1]. On the other hand, some urazole derivatives were found to be potent cytotoxic agents in murrain and human cancer cell lines and also reduce DNA synthesis considerably with moderate reduction in RNA synthesis [2]. With attention to these pharmaceutical properties of urazole derivatives, we anticipated that the synthesis of new nitrogen-containing compounds derivatives with the azide would be useful from the point of view of pharmaceutical properties. To synthesize new nitrogen-containing compounds derivatives we studied the electrochemical oxidation of hexamethylene-bis-urazole in buffer solutions and in the presence of a variety of nucleophile (Scheme 1)[3] .In the present paper, we describe the preparation of a new Nitrogen-containing compounds derivative using electrooxidation of hexamethylene-bis-urazole (**1**) in the presence of sodium azide as nucleophile.



Scheme 1

The results indicate that the imine derived from oxidation of hexamethylene-bis-urazole participate in Michael addition reactions with azide and *via ECECECEC* mechanism convert to the new product, with good yield under controlled potential conditions, at carbon electrode.

Keywords: Urazole, Azide, Electrochemical synthesis

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PS309

Electrochemical tudy of 4-itroso-*N,N*-dimethylaniline in the resence of sodium sulfite: synthesis of new sulfonamide derivatives

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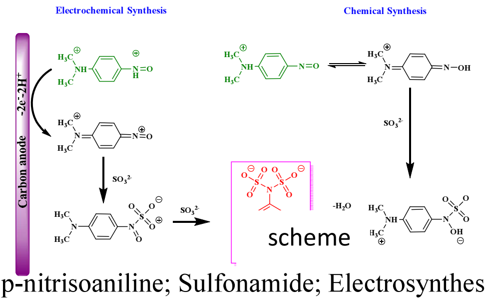
ABSTRACT

Sulfonamides are a large class of antibiotics that interfere with the bacterial synthesis of folic acid from *p*-aminobenzoic acid[1-2]. Electrochemistry also, is a powerful tool for the synthesis of complex organic compounds that covers most of 12 principles of green chemistry[3]. In this work a new sulfonamide derivative was synthesized by the electrochemical oxidation and chemical reaction of 4-nitroso-*N,N*-dimethylaniline in the presence of sodium sulfite as nucleophiles(scheme1). Both processes are practically convenient to carry out and can be performed at atmospheric pressure and room temperature. The electrochemical synthesis was carried out in water at pH=2 and gave the product in 60% yield. The chemical synthesis, carried out in water at pH =5, provided the product in 77% yield. Neither catalyst nor organic/inorganic oxidizing agents are necessary and the reaction can be performed under sustainable and green conditions. Furthermore products were evaluated for their in vitro antibacterial activity. It was found that the some of tested compounds were active against Gram-negative bacteria.



Keywords: *N,N*-Dimethyl-p-nitrisoaniline; Sulfonamide; Electrosynthesis; Michael type addition

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PS310

Replacement of Fe(III) from complex immobilized on the surface by Zr(IV) and Hf(IV) ions from solution phase

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ABSTRACT

Chemical immobilization on the surface modified via nanometric thin film self-assembled monolayers (SAMs) platforms has several advantages [1,2]. Replacement process at the nanostructure assemblies based on defrrioxamation of gold-mercaptopropionic acid, Au-MPA-DFO, surface is studied. In the first stage, capability of the surface for accumulation of two hard metal ions (Hf(IV) and Zr(IV)) was verified, compared and characterized. The surface shows different affinity, organization and structure for these ions when complexed with deferrioxamine. In the second stage, exchange of the Fe(III) ion from DFO-Fe(III) at the Au-MPA-DFO-Fe(III) surface, with the Hf(IV) and Zr(IV) ions from solution phase was studied. The results suggest that the Fe(III) ion from AuMPADFO Fe(III) surface is replaced rapidly eitherby the Hf(IV) or Zr(IV), but with different kinetics. Kinetic studies of the replacement process show the first order rate constants for Hf(IV) and Zr(IV) to be 0.21 and 0.68 s^{-1}, respectively.

More experiments showed selective adsorption of Zr(IV) by the Au MPADFO at pH=0.5. Other cations, even Hf(IV) which has similar properties to Zr(IV), either were not accumulated by the Au-MPADFO or accumulated but very fast replaced by Zr(IV) at the given conditions. This behavior is pH dependent, so that at pHs>2.5, the Al(III) and Fe(III) interfere,and the Hf(IV) and Zr(IV) ions form polynuclear complex with OH^-, and cannot be accumulated by the surface.Validity of the method and applicability of the sensor are successfully tested by determination of Zr(IV) in industrial sample.

Keywords*:* Replacement, Nanostructure, Hf(IV), Zr(IV)

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PS311

Poly(o-aminophenol-co-1,5- dihydroxynaphtalene)/TiO2 nanocomposite: Electrosynthesis and characterization

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ABSTRACT

Conducting polymer/inorganic nanoparticle composites with different combinations of the two components have attracted more and more attention, since they have interesting physical properties and many potential applications [1]. These components are interested because of their unique electrical, optical, and optoelectrical properties [2,3]. Ortho-aminophenol (OAP), (Fig. 1) and 1,5-dihydroxynaphtalene (1,5-DHN), (Fig. 1) are interesting compounds from the point of view of electrochemistry because of the their hydroxyl groups. The hydroxyl group in the phenyl ring can be oxidized to quinone and quinone can be reduced again. In the present work poly(o-aminophenol-co- 1,5-dihydroxynaphtalene)/TiO2 nanocomposite was synthesized by in situ electropolymerization on the gold electrode in 1.0 M HClO4/ethanol solution. In additon, the effects of ultrasonic irradiation on the synthesis of poly(o-aminophenol-co- 1,5-dihydroxynaphtalene)/nanocrystalline TiO2 shell–core composite particles was studied. The polymeric film was prepared by successive cycles of potential (40 cycles) at a potential sweep rate of 50 mV s−1 between −0.2 V and 1.0 V vs. Both poly(o-aminophenol-co-1,5-dihydroxynaphtalene)/TiO2 nanocomposite were charachterized by FT-IR spectroscopy and and conductivity measurments.

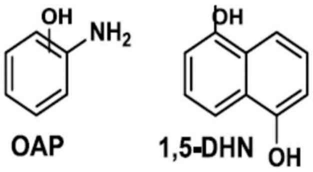

Figure 1: The structure of OAP and 1,5-DHN

Keywords: Copolymer, Ortho aminophenol, 1,5-Dihydroxynaphtalene, TiO_2

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PS312

Electrochemical behavior of pyrocatechol violet (PCV) in aqueous solution on a glassy carbon electrode

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ABSTRACT

Pyrocatechol violet (PCV) is a water-soluble photometric triphenylmethane dye whose color can be attenuated by coordination with metal ions and pH [1]. Electrochemistry of PCV has been investigated in the field of supercapacitor [2]. Electrochemical behavior of pyrocatechol violet (Fig.1) at glassy carbon electrode in aqueous solution was studied using cyclic voltammetry (CV) method. The voltammogram shows an anodic peak and a cathodic counterpart peak. These peaks are related to the oxidation of PCV to its oxidazed form (PCV_{ox}) and vice-versa within a reversible two-electron process. The effect of pH on the electrochemical responses of 1×10^{-3} M PCV was also investigated. It shows that, because of the participation of protons in the oxidation of PCV to PCV_{ox}, E_{pA} shifted to the negative potentials by increasing pH .In various pHs, based on ECE mechanism, the observed homogeneous rate constant of reaction were estimated. The multicyclic voltammograms of PCV in pH=9 display a new redox couple (A_2/C_2) at more negative potentials. The effect of the scan rate and concentration of PCV at pH=9 was studied.

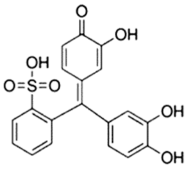

Figure1. Molecular structure of pyrocatechol violet

Keywords: Pyrocatechol violet, Cyclic voltammetry, Electrochemical behavior, ECE mechanism.

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PS313

Evaluation of ozone-electrolysis process for ciprofloxacin antibiotic degradation in the aqueous solution by using Pb/PbO$_2$ and Ti/PbO$_2$ electrodes

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ABSTRACT

The application of new ways, like electrodegradation, to treat effluents containing antibiotics do not have the disadvantages of conventional methods and these result in complete degradation if complete reactions occur [1]. Thus, in this research Pb/PbO$_2$ and Ti/PbO$_2$electrodes were used to degrade antibiotics ciprofloxacin. The present study was conducted in a batch laboratorial pilot. In order to prepare the electrodes: Pb/PbO$_2$ and Ti/PbO$_2$, an electrochemical method was used. Also, scanning electron microscopy (SEM) and X-ray diffraction (XRD) were employed to study the morphology of electrodes' surfaces. Next, the prepared electrodes were applied to treat the antibiotic. Moreover, the variables- pH, current density, contact time, supporting electrolyte and antibiotic concentration were optimized. Finally, at the optimized values, the amount of COD removal and energy consumption were determined. It was found that the operating parameters play a basic role in electrochemical degradation of antibiotics ciprofloxacin and the highest removal efficiency was attained at the optimum conditions as follows: current density 8 mA/cm^2, contact time 60 min in the presence of 5 g/h of ozone and 90 mg/L of the supporting electrolyte. It should be noted that there was a higher antibiotic removal than COD removal, as 99.9% of the antibiotic was removed, just 62% of COD was removed. Also, the results showed that the least energy consumption (19 kWh/m^3 of wastewater) at the optimum conditions. Both electrodes had nearly the same efficiency, but the method of electrode preparation and applicability of the electrodes in real scales are different [1,2].

Keywords: Electrochemical degredation, Antibiotics ciprofloxacin, COD removal, Pb/PbO$_2$, Ti/PbO$_2$

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PS314

Immobilization of methotrexate onto the graphene surface and interaction with calf thymus DNA and 4T1 cells : Surface analysis and electrochemical studies

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ABSTRACT

Immobilization of the chemical and biological *systems* on the solid surface allows excellent control over their behavior and properties, compared with their corresponding behavior in the solution phase. The components of the *immobilized systems* play important roles to improve the behavior and characteristics of the *system*; such as contrasts in imaging and diagnosis, selectivity in drug delivery, and sustain and release efficiency, therapeutic dose and adverse effects of the drugs.

In this work, immobilization of the *methotrexate* (MTX) onto the graphene surface is reported through different methods, including either covalent linkage via (a) EDC/NHS organic activators and (b) electrografting of MTX diazonium salt, or (c) noncovalent bonding, resulting in three different *systems*. To evaluate the interaction ability of the immobilized MTX with biological species, the calf thymus DNA (ctDNA) and the mouse 4T1 breast tumor, as models of the primary intracellular target of anticancer drugs and cancer cells, respectively, are examined. The features of the constructed *systems* and their interactions with ctDNA are followed by surface analysis techniques and electrochemical methods. The results indicate high affinity of the systems for 4T1 cancer cells.

Keywords: Immobilization, Methotrexate; Calf-thymus DNA; Graphene; Anticancer drug

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PS315

Green synthesis of gold nanoparticles for fabrication of an electrochemical sensorsensitive to 4-nitrophenol based on graphenenanoplatelets/gold nanoparticles

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ABSTRACT

Synthesis of nanomaterials using environmentally friendly reagents is one of the interesting applications of green chemistry. Synthesized nanoparticles by the aim of green reagents are used in various applications such as drug delivery, sensors and therapeutics [1,2]. 4-Nitrophenol (4-NP) is one of the hazardous chemicals in contaminate list of environmental protection agency (EPA) duo to its stability and poisonous. As a result, monitoring of 4-NP in water resources using a sensitive and selective electrochemical sensor is highly interested.In this work, a novel method was presented for green synthesis of gold nanoparticles (AuNPs) using extracted *E. tereticornis* leaves as the reducing agent in the presence of $HAuCl_4$ in ambient temperature. The synthesized AuNPs was mixed with graphenenanoplatelets (GNPs) under sonication to form a homogeneous nanocomposite (AuNPs/GNPs). Characterization of the nanocomposite using UV-Visible spectroscopy, FESEM-EDX and TEM showed a homogeneous distribution of AuNPs nanoparticles. Under optimal conditions of phosphate buffer (0.01 M, pH 4.0), scan rate of 0.05 V s^{-1}, drop casting volume of 10 □ drop nanocomposite ratio (AuNPs:GNPs) of 5.0 (V/V), differential pulse voltammetry of 4-NP showed an oxidation peak at around 0.025 V (*vs*. Ag/AgCl) due to exchange of 2 electrons and protons. The calibration curve was linear in the range of 5-80 □rang^{-1} with limit of detection (LOD) of 0.6 □with^{-1}. Finally, the fabricated sensor was successfully applied for determination of 4-NP in river water, reverse osmosis drink water and mineral water with recoveries more than 95%.

Keywords: E. tereticornis, Au NPs, Graphene nanoplatelets, Electrochemical sensor, 4-Nitrophenol

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PS316

Fabrication of paper-based electrochemical cell with pencil-drawn electrodes

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ABSTRACT

In this work, a paper-based electrochemical device with pencil-drawn electrodes is designed. The fabrication is based on hand drawing electrode on paper using a pencil and the rest portion is covered with wax. For evaluation the performance of designed paper-based electrochemical cell, electrocatalytic reaction of ferrocene (Fc) with ascorbic acid (AA) is used as model.

In this line, working pencil-drawn electrode is modified with Fc and gold nanoparticle (AuNP) by physical adsorption (C-AuNP-Fc electrode). The cell performance and electrocatalytic oxidation of AA is evaluated using cyclic voltammetry. Conditions and parameters that influence the measurement of AA are optimized. CVs of C-AuNP-Fc electrode in AA solution with phosphate buffer (pH=7, 0.1M) are recorded.

Analysis of data from cyclic voltammogram and calibration curve show there is a good linear relationship between peak area electrocatalytic oxidation wave of AA and concentration of AA at C-AuNP-Fc electrode (10µM-125µM). Line equation is obtained to be $y=0.4837x-0.7881$ with a correlation coefficient of 0.9940. With repeated measurement on the blank solution, detection limit of 1.5µM is calculated. The validity of the method and applicability of paper-based cell are successfully tested by determining of AA in vitamin C tablet sample.

Keywords: Paper-based electrochemical cell, Pencil-drawn electrodes, Ascorbic acid, Electrocatalytic reaction.

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PS317

Preparation of an efficient electrocatalyst for oxalic acid oxidation based on Ag-doped ZSM-5 nanozeolites synthesized from bagasse

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ABSTRACT

In this work, we report a new modified carbon paste electrode based on silver incorporated in ZSM-5 nanozeolite (Ag/ZSM-5/CPE) for oxalic acid (OA) electrooxidation. ZSM-5 nanozeolite was synthesized using amorphous silica extracted from bagasse (BGA) as silica source and were characterized by the X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared (FT-IR), Brunauer–Emmett–Teller (BET), Barrett-Joyner-Halenda (BJH) and energy dispersive X-ray (EDS). Accumulated spherical nanoparticles were formed with range of closely particle size of 82-163 nm. Ag/ZSM-5/CPE was used to investigate the electrocatalytic oxidation of OA in 0.1 M PBS (pH= 2) solution by cyclic voltammetry, differential pulse voltammetry and amperometry. The current intensity of OA oxidation increases impressively on Ag/ZSM-5/CPE in the presence of OA. Additionally, amperometric studies displayed that this electrode as the sensor can detect OA in linear ranges of 16 μM – 0.18 mM and 0.18–4.0 mM with a detection limit of 5.5 μM (S/N=3). Excellent utilities of the fabricated modified electrode such as low detection limit, wide linear range of concentration and high sensitivity make it as good sensor for the selective determination of OA. Ag/ZSM-5/CPE was used for OA detection in real samples such as spinach and cabbage. Possible interferences such as ascorbic acid, tyrosine, uric acid, ethylene glycol, glyoxylic acid and dimethyl oxalate for the detection of OA at the Ag/ZSM-5/CPE were studied. The results exhibits that these compounds do not show any interference on OA measurement.

Keywords: Bagasse, ZSM-5 nanozeolite, Modified carbon paste electrode, Oxalic acid

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PS318

Design and construction of high-performance pilot-scale cell for pharmaceutical wastewater treatment by electrocoagulation-flotation processes

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ABSTRACT

In recent years, concerns about the scarcity of water resources and environmental issues, have been caused to development of methodologies and instrumental for treatment of pharmaceutical wastewater could be present in our life cycle [1, 2]. This process can be done with considering of active pharmaceutical ingredients, solvents, intermediates and raw materials [3]. Electrocoagulation (EC) as an electrochemical method has developed to overcome the drawbacks of conventional pharmaceutical industry wastewater treatment technologies. Electrocoagulation-Flotation (ECF) processes are simple, time and energy economic in water and wastewater treatment [4]. This work study the use of ECF for treatment of wastewater obtained from a pharmaceutical industry. The wastewater primarily contained Opium alkaloid, Codeine, Methadone, Morphine, Oxycodone and Buprenorphine. The ECF reactor in a pilot scale with an approximate volume of 200 liters which is equipped with Al and Fe electrodes (400*250*2 mm) was used for pharmaceutical industry wastewater treatment. The effects of operating parameters such as current density (2-20 mA/cm^2), initial pollutant concentration (initial COD between 10000 and 70000 mg/L), type of electrode material, reaction times (5 to 60 min) and initial pH of the solution (4 to 12) have evaluated. In addition, efficiency of COD and TOC reduction, electrical energy consumption and current efficiency were also studied for treating the above-mentioned wastewater treatment. The results described that the maximum reduction of COD and TOC was about 94% and 82% at optimum current density of 10-15 mA/cm^2 and electrocoagulation time of 30 min for 150 L in a pilot scale of the wastewater, respectively. Also, in the above mentioned conditions, the electrical energy consumption and current efficiency were at about 3.5 KWh/Kg COD and 96%, respectively. The best our knowledge, this achievement can be an optimized and high progress rout for the wastewater treatment of pharmaceutical industry.

Keywords: Electrocoagulation-flotation, Pharmaceutical industry, Alkaloid compounds, Wastewater Treatment.

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PS319

Electrochemical synthesis of the new substituted quinoneimines

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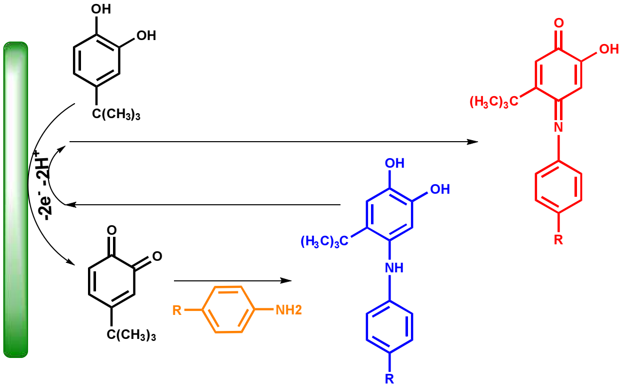
ABSTRACT

QuinoneImines (QI) have included a wide range of dye compounds. These compounds used in hair coloring, determination of ammonia, identifying of phenolic compounds and redox indicators [1-2]. QuinoneImines (QI) dyes have been synthesis by a large variety of chemical methods [3]. In order to the electrochemical synthesis of the new substituted QuinoneImines, the electrochemical oxidation of 4-tert-butylcatechol (TBC) was performed in the presence of aromatic amines as nucleophile at a carbon electrode, in ethanol/buffer solution. The cyclic voltammograms data show that TBC can be oxidized electrochemically to the corresponding quinone, that can, further, be attacked as Michael acceptors by a variety of nucleophiles (aromatic amines) and via an ECE mechanism (4e$^-$ per molecule of TBC) converts to the corresponding new QuinoneImine derivatives. The separated products were characterized by IR, UV, 1H NMR, 13C NMR and MS.



Scheme 1

Keywords: Electrochemical synthesis, QuinoneImines, Aromatic amines.

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PS320

Preparation and electrochemical properties of nano composite Li2S/CMK-5 electrode

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ABSTRACT

Rechargeable Lithium- Sulfur batteries are very interesting due to their low cost, high energy density, non-toxic and natural abundance of Sulfur. There are also other problems such as low electrical conductivity, structure and volume changes during charge and discharge, dissolution of polysulfides in the electrolyte, and dendrite formation on the Li anode, which can lead to low cycle life and reduce battery capacity. Li–S batteries can be manufactured in two ways: using a sulfur cathode coupled to a Lithium metal or lithiate anode; or using a Li_2S cathode paired with Lithium, carbon, Si or Sn anode or new Si anode. Li_2S Cathodes have attracted large interest recently because they advantageously enable the use of Lithium- free anodes. The micro sized Li_2S suffers from fast capacity, low capacity and low coulombic efficiency due to slow charge transfer between electrolyte and active materials [1-3]. Reversibility and cycling stability of micro- sized Li_2S electrode could be improved by reducing particle size nano- scale by CMK-5 mesoporous carbon to improve electronic conductivity, enhance conductivity, enhance charge transfer, enhance capacity and enhance coulombic efficiency. Due to the improved conductivity and reduced polysulfide dissolution, the Li_2S/CMK-5 cathode exhibits enhanced electrochemical performances with a high capacity of 767 mAh/g at 0.1C.

Keywords: Battery, Lithium- sulfur, Li_2S/CMK-5 composite cathode

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PS321

Synthesis of bismuth sulfides nanosheets combined with metal oxides or metal sulfides and their application in energy conversion devices

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ABSTRACT

Through a simple method bismuth sulfide nanosheets were synthesized and located cobalt oxide nanostructures on bismuth sulfide substrate.

With different analysis methods such as Energy-dispersive X-ray (EDX),scanning electron microscopy(SEM) and cyclic voltammetry (CV) techiques were confirmed immobilization of cobalt oxide componds on to bismuth sulfide nanosheets. High repeatability of electrochemical behavior confirmed will strong bonding and stability of the immobilized componds on to bismuth sulfide surface. The results revealed that composite containing show suitable electrochemical and capacity for using in design of supercapacitor. The use of the composites as a supercapacitor for compond on bismuth sulfide exhibit capacitance 1400 F/gr .

Keywords: Supercapacitor, Nanosheets, Bismuth sulfide, Cobalt oxide

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PS322

Novel electroactive nanocomposite of Pty/ZnO for highly efficient energy storage and electrocatalyst DMFC

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ABSTRACT

In the methanol fuel cell, the electrical energy with high efficiency is produced from the direct combination of methanol and oxidizing electrical energy. In this study, the main aim is utilizing a suitable catalyst to enhance the performance of the methanol fuel cell. The performance of this system has been investigated using electrochemical methods such as cyclic voltammetry, electrochemical impedance spectroscopy, and amperometry. First, the Pty/ZnO nanocomposite has been synthesized on the surface of the working electrode through cyclic voltammetry method. Through this process, nanocomposite has been formed on the surface of the working electrode by first putting in Ni solution and then NaOH nickel oxide solution. The α value has been calculated from the slope of log current vs log potential scan rate plot, and using α, the fractal dimension value was calculated. Utilizing the electrochemical impedance spectroscopy method, the conductivity and electrical resistivity of Pty/ZnO nanocomposite has been studied in different concentration of methanol. Finally, the net effect of catalytic nano-particles used in Pty/ZnO working electrode in the concentration rang of 0.001- 0.5M was investigated by chronoamperometry.

Keywords: Nanocomposite, Tyramine, ZnO

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PS323

Binder-free prickly nickel nanostructured/reduced graphene oxide composite: a highly efficient electrocatalyst for hydrogen evolution reaction

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ABSTRACT

Here, a *binder-free* nanocomposite, prickly nickel nanostructured/reduced graphene oxide nanosheets, is constructed via *electroless-deposition* on cupper surface covered with a fresh prelayer of nickel ($Cu-Ni_{fpl}$-PNiNS/RGONs) for the first time. Then, the fabricated system is tested successfully for the HER in alkaline solutions. The results show that the hedgehog-like prickly nickel nanostructures wrapped in the RGONs cloth are formed, *pinning* the PNiNS/RGONs into the $Cu-Ni_{fpl}$ surface, resulting in exceptional *stability* and *activity* for the $Cu-Ni_{fpl}$-PNiNS/RGONs system. The *electrocatalytic activity of the nanocomposite* towards the HER as $\eta_{20} = -57$ mV, Tafel slope = -43 mV dec^{-1} and $j_0 = 1.05$ mA cm^{-2}, is quite close to -22 mV, -40 mV dec^{-1} and 5.88 mA cm^{-2}, obtained in the same conditions for commercial Pt/C, respectively. The remarkable increase in electrocatalytic activity was found to be originated partially from increase in the *surface roughness* and mainly from *synergetic* chemical coupling effects between PNiNS and RGONs.

Keywords: Graphene, Nickel nanostructure, Nanocomposite, Electrocatalyst, Hydrogen evolution reaction

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PS324

Nanostructure polyoxometalates containing Co, Ni, and Cu as powerful and stable catalysts for hydrogen evolution reaction in acidic and alkaline solutions

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ABSTRACT

A new form of $[PW_{11}MO_{39}]^{5-}$@Ru-reduced graphene oxide (rGO) (M: Co, Ni, and Cu) was prepared by depositing $[PW_{11}MO_{39}]^{5-}$ on the surface of Ru-rGO. The behavior of the polyoxometalates (POMs) toward hydrogen evolution reaction (HER) was studied in acidic and alkaline media. Different techniques were used for the characterization of the nanocomposites. These included voltammetry and electrochemical impedance spectroscopy to determine the electrocatalytic properties of the nanocomposites toward HER, and Tafel plots to calculate the kinetic parameters and to identify the possible mechanisms involved in the HER process. Results showed that HER on $[PW_{11}MO_{39}]^{5-}$@Ru-rGO electrodes obeyed the Volmer-Heyrovsky mechanism. The enhanced HER rates on the modified electrodes were attributed not only to the presence of POM nanoparticles on the electrode surface but also to the resulting enhanced surface areas. These results demonstrate the effective performance of the nanocomposites used as HER catalysts in acidic and alkaline media in conformance with green chemistry objectives. The catalysts are especially advantageous for their desirable capacity, durability, favorable kinetics, and low price.

Keywords: Polyoxometalates, Ru-reduced graphene oxide nanocomposites, Reduced graphene oxide, Electrocatalyst, Hydrogen evolution reaction.

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PS325

Electrodeposition and characterization of nanostructures Co (Al,Cu); Application in supercapacitors

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ABSTRACT

Among the transition metals, cobalt-based compounds have revealed good behavior in electrochemical capacitors. In these years, several mixed binary systems have beeninvestigated such as Mn-Co oxide, Ni-Co oxide and so one. These mixed oxides have shown improved properties such as, electronic conductivity, specific capacitance and cyclic durability as electroactive materials for pseudocapacitors. Metal oxide hybridspossess large areas than the purity oxides or hydroxides. So, their average specific capacitance is higher. As an example, Co/Al layered double hydroxides were considered as electrode materials in supercapacitors that due to the addition of Al atom, increase the electrochemical active sites. Also, possessing an special nanostructures can decrease the diffusion distance of electrolyte ions remarkably and improve the material utilization [1]. In this work, some mixed binary systems Co-Al and Co-Cu were synthesized by cathodic deposition on steel electrode in galvanoststic mode. The resultants were characterized by variety of methods including XRD and SEM. These mixed binary systems will be used as electroactive materials in supercapacitors.

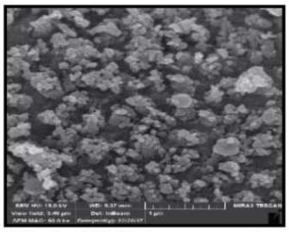

Fig 1. SEM binary metal oxide Co-Cu

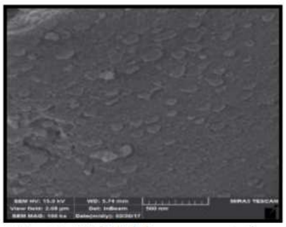

Fig 2. SEM binary metal oxide Co-Al

Keywords: Electrodeposition, Mixed binary system, Supercapacitor **Fig 1.** SEM binary metal oxide Co-Cu **Fig 2.** SEM binary metal oxide Co-Al

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PS326

High energy density supercapacitors based on Ni/NiO-$MnCo_2O_4$ electrode

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ABSTRACT

Supercapacitors are kind of energy storage devices that have higher power density than conventional batteries. But their applicability is limited by their relatively low energy density. One of the solutions to overcome this limitation is use of pseudocapacitive electrode materials such as metal oxides. In the present study, we fabricated and characterized Ni foam supported Ni/NiO-$MnCo_2O_4$ electrode. First, zinc oxide nanorods were grown on Ni foam via sol-gel process and their morphology was confirmed by SEM. Then, ZnO nanorods were covered by a thin layer of nickel oxide via electrochemical deposition. After chemical removal of zinc oxides and subsequent annealing, nickel oxide nanotubes were achieved and their morphology was confirmed by SEM. In the next step, manganese-cobalt nanostructures were formed on Ni/NiO via electrochemical methods. The as-prepared Ni/NiO-$MnCo_2O_4$ electrode that characterized by SEM, XRD and electrochemical analysis showed the specific capacitance of 1835 $mF.cm^{-2}$ in 1 M KOH electrolyte at current density of 2 mA cm^{-2}. The results showed that this electrode can be used as an electrode in high energy density supercapacitors.

Keywords: High energy density supercapacitors, Nickel oxide, Manganese-cobalt oxide

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PS327

Electrochemical synthesis of thin layers MoS_x nanostructures with enhanced catalytic activity toward hydrogen generation

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ABSTRACT

Relying on non-renewable fossil fuel resources to supply our growing energy demands has a dangerous dark side. Hydrogen was introduced as a renewable, clean and cheap alternative source of energy since two decades ago. Platinum (Pt) derivatives are the most popular catalyst to accelerate the hydrogen evolution reaction (HER) from electrolysis of water or acidic aqueous solution, but the high cost of Pt catalyst limited its widespread application. Tremendous efforts have been focused on the cost-effective hydrogen production catalysts. Transition metal chalcogenides (TMCs) such as MoS_2 and MoS_3 are scientifically and economically considered because of their abundance and capability in electronic, catalysis and so on.

The objective of our project is designing an electrocatalyst or photoelectrocatalyst based on MoS_2 and MoS_3 thin film substrate for HER. Accordingly, a thin layer of MoS_x nanostructure is electrochemically deposited on the surface of different electrodes such as glassy carbon electrode (GCE), gold (Au) and indium thin oxide (ITO). Morphology of the electrode surface is investigated by scanning electron microscopy. Electrochemical investigation revealed the highest catalytic activity for MoS_3/Au electrode where, exhibits an onset overpotential of HER as low as -0.17 V vs. RHE electrode, and a Tafel slope as well as Pt/carbon catalyst in 0.5 M H_2SO_4 aqueous solution. An increased catalytic activity and stability of MoS_3 is achieved when the graphene is utilized as substrate or substituted by cobalt oxide.

Keywords: Renewable energy source, Hydrogen evolution reaction, Electrocatalyst, MoS_2 and MoS_3

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PS328

Simultaneous detection of methyldopa and hydrochlorotiazide with ZnO/Al_2O_3 nanocomposite modified electrode

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ABSTRACT

Methyldopa and hydrochlorothiazide are applied in treatment of hypertensis. Methyldopa works by controlling nerve impulses along certain nerve pathways. As a result, it relaxes blood vessels so that blood passes through them more easily. Hydrochlorothiazide helps reduce the amount of water in the body by increasing the flow of urine. It has been proved that electrochemical methods, compared with other methods, are very simple, sensitive, cost effective and rapid for the determination of analytes. Also, the bare electrodes very often suffer from the fouling effect, which results in rather poor sensitivity and selectivity. Hence, it is significantly important to develop new materials with excellent properties and suitable designs to gain modified electrode owning superior performance. ZnO nanostructures due to wide band gap, large excitation binding energy, non-toxicity, biocompatibility, chemical and photochemical stability, and high electron communication features is preferred for the fabrication of effective sensors. It is widely accepted that ZnO acts both as an electronic and structural promoter exhibiting a major influence on the catalytic activity, while alumina or other refractory oxides mainly increase the long-term stability as structural promoter of the catalyst system. Eliminating any of the constituting components severely reduces the performance of the catalyst system. Consequently, the interest in ZnO/Al_2O_3 nanocomposite as catalytic materials remains very high [1,2]. In this work, the ZnO/Al_2O_3 screen printed electrode sensor exhibited excellent electron-mediating behavior towards the oxidation of methyldopa and hydrochlorotiazide. By using the differential pulse voltammetry (DPV) technique, the calibration curves for methyldopa and hydrochlorotiazide were found linear with the concentration range of 1.0 µM – 100.0 µM and 0.1 µM – 100.0 µM respectively. Additionally, the prepared electrochemical sensor of ZnO/Al_2O_3/SPE demonstrated a practical feasibility in real samples determination.

Keywords: Methyldopa, Hydrochlorothiazide, ZnO/Al_2O_3 nanocomposites, Voltammetry, Modified electrode.

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PS329

A new electrochemical sensor for detection of curcumin using NiAl-LDH modified glassy carbon electrode

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ABSTRACT

Curcumin (CM) with the chemical name of (1E,6E)-1,7-bis (4-hydroxy-3-methoxyphenyl)-1,6-heptadiene 3,5-dione is known for its antitumor, antioxidant,.anti-arthritic, anti-amyloid, anti-ischemic, and anti-inflammatory properties [1]. In this work an electrochemical sensor was developed for curcumin detection using of NiAl-layered double hydroxide (LDH) on a glassy carbon electrode (GCE) referred to as NiAl-LDH/GCE. NiAl-LDHs were synthesized by electrochemical method at an applied potential of -0.9 V vs SCE with the deposition time of 120 s. Electrochemical performances related to the direct electroxidation of CM at the modified electrode were investigated, showing that their peak currents were greatly enhanced due to the presence of NiAl-LDH. Leading to the increase of their electrocatalytic activity at the surface of NiAl-LDH/GCE. The effects of different parameters such as pH, accumulation time, accumulation potential, and scan rate on the sensitivity were investigated too. The electrocatalytic activity of LDH toward CM electrooxidation was studied by and differential pulse voltammetry (DPV) methods. The linear range of 12 pM -10 µM, with a detection limit of 10 pM of CM were found by DPV. Finally, the proposed electrochemical sensor was employed for the determination of CM in the real samples.

Keywords: Glassy carbon electrode, Layered double hydroxides Ni/Al-LDHs, Curcumin, Electrochemical sensor

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PS330

Using modified montmorillonite for electrochemical determination of phenol in aqueous solution

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ABSTRACT

Sodium montmorillonite(MMT) was modified with sulfonic acid-functionalized ordered nanoporous Na^+ -montmorillonite (SANM) via replacement of its inorganic exchangeable cations [1]. The resulting modified MMT (SANM) was used to modify the carbon paste electrode (CPE). The electrochemical behaviors of phenol at the unmodified CPE, MMT-modified CPE and SANM modified CPE were examined. Phenol oxidation in aqueous solution was carried out in a pH range 5 to 9 using cyclic voltammetry (CV) and differential pulse voltammetry (DPV). A conventional three-electrode system, consisting of a (SANM)-modified carbon paste working electrode, a saturated calomel reference electrode (SCE) and a platinum wire auxiliary electrode, was employed[2]. The effect of supporting electrolyte on the oxidation of phenol was examined and 0.1 molar phosphate was finally employed. A pH of 7 was chosen as the optimum pH. In addition the influnces of mass content of CPE/SANM was also investigated. The optimal mass content is 0.06 g (PEC) and 0.04 (SANM). Repetitive measurements indicated that this electrode has a good reproducibility (RSD1.32 %). A linear relationship is observed between the peak current and the concentration of phenol in the range of 5 to 100 micro molar levels. The limit of detection is estimated to be 4.65×10^{-7}mol L^{-1}.

Keywords: Phenol; Cyclic voltammetry; Differetia pulse voltammetry; Electrochemical oxidation; Montmorillonite

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PS331

Electrochemical sensor based on functionalized carbon nanotubes paste to identify neurotransmitter dopamine

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ABSTRACT

Sulfonic acid-functionalized ordered nonporous Na^+ montmorillonite(SANM)- functionalized - multi-wall carbon nanotube modified carbon paste electrode (SANMCNPE) was fabricated and the electrochemical behavior of neurotransmitter dopamine (DA) was investigated on it, using cyclic voltammetry, chronoamperometry and differential pulse voltammetry. A comparison of the data obtained from the electrocatalytic oxidation of DA at SANMCNPE, COOH- MWCNTCPE, and SANMCPE clearly shows that a combination of COOH-MWCNTs and SANM definitely improves the characteristics of DA electrocatalytic oxidation. The results show that SANMCNPE reduces over potential of DA oxidation. The separation of the anodic and cathodic peaks potentials of dopamine using by cyclic voltammetry at CPE, SANMCPE, CNPE and SANMCNPE electrodes is 430, 230, 175, 110 mV respectively. The oxidation peaks currents of DA increased significantly (about 6 times)at SANMCNPE compared to unmodified CPE. The experiments have been used under the optimum pH of 7.0 in 0.1M phosphate buffer solution. The CV anodic and cathodic peaks current 100 µM of DA showed a liner relation scan rate square root. Under the optimal conditions and using by differential pulse voltammetry the anodic peak currents increased linearly with the concentration of DA in the range (0.5 to 90 and 90 to 1000 µM) and the detection limit 7.0 $\times 10^{-2}$ µM was calculated.

Keywords: Dopamine, Functionalized carbon nanotube, Sensor, Montmorillonite

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PS332

Carbon paste electrode modified with core shell nanoparticles as modifier for determination of Ascorbic acid

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ABSTRACT

L-Ascorbic acid (AA) is an essential nutrient for humans and an important compound from the clinical and the food industrial points of view. AA has been used for the prevention and treatment of many disorders, including atherosclerosis, common cold, Alzheimer's disease, mental illness, infertility and cancer [1]. AA is easily oxidized chemically and electrochemically to L-dehydroascorbic acid (DHA) and partially metabolized to inactive sulfide and oxalic acid, which is eliminated largely by urinary excretion. The electrochemical methods using chemically modified electrodes (CMEs) have been widely used as sensitive and selective analytical methods for the detection of the trace amount of biologically important compounds [3]. One of the most important properties of CMEs has been their ability to catalyze the electrode process via significant decreasing of overpotential respect to relatively selective interaction of the electron mediator with the target analyte in a coordination fashion. These electrodes are capable to considerably enhance the selectivity in the electroanalytical methods [4]. Some advantages of using the modified electrode are ease of preparation, low cost, potential window, ease modification, excellent electrical conductivity and increasing the surface of the electrode [5]. In this work, a sensitive and selective electrochemical method for the determination of AA was developed using a modified carbon paste electrode (MCPE) with modifier and core–shell magnetic nanoparticles. The electrochemical response characteristics of the modified electrode toward AA were investigated by cyclic and square wave voltammetry.

Keywords: Ascorbic acid, Core–shell magnetic nanoparticle, Electrocatalytic, Carbon paste electrode, Modifier

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PS333

Electrochemical aptasensor based on gold nanoparticles, carbon nanotubes and graphene for sensing of salivary and urinary lysozyme

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ABSTRACT

Changes in lysozyme contents is sign of some disease, for example the increasing concentration of lysozyme in serum and saliva may be caused by leukemia [46] and several kidney problems [1, 2]. An electrochemical label free aptasensor was designed to measure the protein lysozyme. In this study, MWCNTs, gold nanoparticles, reduced graphene oxide and chitosan were used to increase the electrical conductivity and surface area. Differential pulse voltammetry, cyclic voltammetry and electrochemical impedance spectroscopy techniques were applied to study the electrochemical properties and importance of synthesized nanocomposite. Based on calibration curve, the detection limit of 6 fmol L-1 and the linear range of 0.01-100.00 pmol L-1 were obtained. The repeatability and reproducibility of this aptasensor were 2.39 and 4.01% respectively. In addition, the 6% reduction in signal after 30 days of storage represented high stability of aptasensor. The effectiveness of the apatasensor was evaluated in real sample such as human saliva and urine and finally the obtained data were compared with data from high performance liquid chromatography (HPLC) method.

Keywords: Lysozyme, Aptamer, Differential pulse voltammetry, Aptasensor, Electrochemistry

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PS334

Synthesis, characterization and application of novel ion-imprinted nanopolymer as a new electrode material for determination of lead(II) ions in water samples

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ABSTRACT

In this work, we report on the design of a selective electrode based on the use of magnetic ion-imprinted polymer (Fe_3O_4@SiO_2@IIP) as a novel and selective electrode for the differential pulse voltammetry determination of lead ions from various complex matrixes. This magnetic ion-imprinted polymer was synthesized by application of 4-vinilpyridine (4-VP) as a functional monomer, ethylene glycol dimethacrylate as a cross-linker, 2,2-azobisisobutyronitrile as a initiator, and lead ions as a template ion.

In this work, the performance of a carbon paste electrode (CPE) modified with the IIP-NPs for the electrochemical determination of the Pb(II) ions was evaluated. The electrochemical behavior of the IIP-CPE sensor was investigated by differential pulse voltammetry. In the present work, combining the advantages of high selectivity from the IIP nanoparticles technique and high sensitivity from CPE detection, a IIP-CPE sensor has been developed for the determination of lead ion. The response of modified electrode to Pb(II) was linear in the 5.0×10^{-7} to 1.0×10^{-1} M concentration range. The limit of detection (LOD) of the sensor was 1.0×10^{-7} M (at S/N =3). The sensor was successfully applied to the trace determination of Pb(II) in spiked water samples.

Keywords: Ion-imprinted nanopolymer, Ion selective electrode, Lead(II)

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PS335

Preparation a modified carbon paste electrode (CPE) based on sulfanyl phenyl schiffs base to determination of mercury (II)

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ABSTRACT

In this article, Preparation a modified carbon paste electrodes of the ion- selectivity of mercury (II) based on the new synthetic ligand ((2-Mercapto phenyl) imino methyl) benzene 1-2 diol described. To modify the electrode, paraffin oil and multi-walled carbon nanotubes (MWCNT) were used as binder and modifier respectively. using this electrode, a good Nernstian slope of 30.036±0.2 mV per decade for mercury(II) ion over a concentration range from 1×10^{-7} to 1×10^{-1} M was obtained at pH 4.5 after 5 s response time.

At the optimal conditions, the lowest limit of detection 2.3×10^{-78} were reported for modified electrode. The modified Ion-selective electrode was successfully applied for titration with standard solution of EDTA. Using this electrode, the concentration of mercury (II) ions were determined in a variety of real samples.

Keywords: Mercury; Modified carbon paste; Schiffs base

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PS336

Electrochemical determination of p-aminophenol in the presence of paracetamol using a carbon paste electrode modified with mixed metal sulfides/ reduced graphene oxide nanocomposite

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ABSTRACT

p-Aminophenol (PAP) is a synthetic intermediate or a degradation product of the paracetamol and it is found in pharmaceutical formulation [1]. Because of significant toxicity such as teratogenic effect and nephrotoxicity, the maximum content of PAP in pharmaceuticals should not exceed to 50 ppm [2]. Therfore, to better control the drug quality, the development of a simple and accurate method for the determination of PAP in the paracetamol formulations is very important.

In this study, a sensitive electrochemical method based on mixed metal sulfides/ reduced graphene oxide(ZnS-CdS-Ag_2S/rGO) nanocomposite was developed for determination of PAP in pharmaceuticals samples. ZnS-CdS-Ag_2S/rGO nanocomposite was prepared through hydrothermal method using thiourea as a sulfur source. The morphology and structure of the prepared nanocomposites were investigated by X-ray diffraction (XRD), field-emission scanning electron microscopy (FE-SEM) and Fourier transform infrared spectroscopy (FT-IR). Afterwards, the nanocomposite was incorporated into the carbon paste electrode, and the resulting modified electrode was applied to determine the PAP in paracetamol formulations. Under optimum conditions ,the linear ranges for the determination of PAP using differential pulse voltammetry were 10–600 µM .

Keywords: Reduced graphene oxide, Carbon paste electrode, Hydrothermal, p-Aminophenol

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PS337

Facile electrochemical synthesis of core–shell quantum dots on graphene–oxide modified electrode for development of sensitive biological sensor

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ABSTRACT

Many kinds of nanomaterials have been used in direct electrochemistry of biomolecules, catalytic activity and also construction of electrochemical sensors and biosensors. Among them, semiconductor quantum dots (QDs) such as CdS, CdTe, ZnS, etc. have received considerable interest in the fields of electrochemical sensors. Semiconductor quantum dots are nanometer-scale crystals, which have unique properties. They show many advantages due to their high surface-to-volume ratio, high reactivity, small size, chemical stability, biocompatibility, low toxicity and excellent reaction by biomolecules [1]. CdS Quantum dot is a good candidate material for the construction of sensors. Moreover, ZnS, as a semiconductor owing to its nontoxicity to human body, low expense and abundance, becomes a suitable candidate to fabricate ZnS@Cds core–shell structures [2]. This paper reported an ultrasensitive electrochemical biosensor which was based on ZnS@Cds quantum dot which was synthesized by cheap and facile electrochemical technique at the surface of graphene oxide/glassy carbon electrode (GO/GCE). The modified electrode exhibited good behaviors in the simultaneous detection of guanine (G) and adenine (A) with the peak separation as 310 mV. All the measurements were done in citrate–phosphate buffer solution 0.1 M (pH 6.5) and the accumulation buffer solution was acetate (pH=5.2). The detection limit (S/N = 3) for A and G was found to be 8.3 and 6.4 nM. The resulted sensitivities toward G and A were 1.13 and 1.59 μA/μM in the linear concentration range of 0.05-40 μM for G and 0.01-40 μM for A, respectively. The value of (G + C)/(A + T) in denatured human DNA was calculated to be 0.80. The results indicated that the ZnS@CdS/GO/GCE modified electrode exhibited an excellent performance such as selectivity, sensitivity and reproducibility towards the determination of G and A.

Keywords: Quantum dots, ZnS@CdS, Guanine, Adenine, Electrosynthesis

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PS338

Novel graphene-Pd/Ag nanoparticles composite modified carbon paste electrode as a novel hydrazine sensor

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ABSTRACT

In this work, Pd and Ag nanoparticles (pd/Ag NPs) electrodeposited on an electrochemically reduced graphene oxide(ERGO) modified carbone paste electrode, was prepared for the amprometric determination of hydrazine. It efficiently oxidizes hydrazine at a low overpotential of −0.1 V versus SCE. The Pd/Ag/graphene/CPE was used for determination of hydrazine in phosphate buffer solution of pH 7.0. The amperometric current response of the electrode was increased linearly over a hydrazine concentration of 0.5–200 μM with a limit of detection of 0.09 μM .The prepared hydrazine sensor exhibited high sensitivity, good selectivity reproducibility and long term stability.

Keywords: Composite, Nanoparticles, Palladium, Graphene

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PS339

Development of an aptasensor for tetracycline detection based on poly(L-glutamic acid) modified glassy carbon electrode

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ABSTRACT

Aptamers are artificial DNA or RNA ligands which can be used for basic research, and they have recently been used to measure macromolecular drugs including tetracycline for clinical purposes [1]. Tetracycline (TET) is a part of a drug family of antibiotics which bind to the ribosome and block protein building [2]. TET has been measured by various methods, including HPLC, colorimetry, capillary electrophoresis (CE), and electrochemical methods [3,4]. Among the electrochemical methods, designing aptasensors has advantages such as having high chemical stability for a wide temperature range, reversible denaturation and rapid synthesis.

In this work, the fabrication of an aptasensor was investigated based on poly(L-glutamic acid) on the surface of GCE (PGA/GCE). The electropolymerization was performed on the electrode surface by cyclic voltammetric scan between -0.5 to 2.0 V at a scan rate of 100 mV/s (vs Ag/AgCl electrode) and 12 cycles.The terminal carboxylic acid groups of PGA-modified GCE provides a suitable base for attaching the aptamer. For interaction of PGA/GCE with anti-TET, the anti-TET solution was dropped on the surface of the electrode. The final modified electrode (anti-TET/PGA/GCE) was characterized by SEM, EIS, and voltammetric methods. The effects of aptamer concentration, aptamer immobilization time, and TET reaction time were investigated. Under optimum conditions, the sensitivity of aptasensor was investigated by EIS and DPV. The linear range and the detection limit for TET with the anti-TET/PGA/GCE aptasensor were found to be 1.0×10^{-6}-1.0×10^{-14} M and 3.5×10^{-15}M respectively by EIS method. The proposed aptasensors were applied for determination of TET in some real samples such as drug. This technique is a label-free detection method, and it is not necessary to modify the interest biomolecules with markers such as enzymes or other redox labels.

Keywords: Tetracycline, Electropolymerization, Aptamer, Electrochemical impedance spectroscopy

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PS340

Simultaneous determination of sunset yellow and erythrosine in soft drinks using multi-walled carbon nanotube paste electrode

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ABSTRACT

At present, synthetic dyes are widely used to make food more attractive and appetizing [1]. Synthetic colors usually include the compounds with azo bond, benzene and xanthene. Although most food dyes are expected to be safe if their dosages are strictly limited, some studies have indicated carcinogenicity and toxicity related to commonly used food dyes [2].

Herein, a multi-wall carbon nanotube modified carbon-paste electrode (MWCNT-CPE) was fabricated and used for the simultaneous determination of two frequently used food dyes, Sunset yellow (SY) and Erythrosine (EY). All the voltammetric measurements were carried out using a model PGSTAT30. A three-electrode system was used with a bare and modified carbon paste working electrode, a KCl-saturated Ag/AgCl reference electrode and a Pt wire as the counter electrode.

After optimizing the experimental conditions such as pH, scan rate, pulse height, accumulation time and amount of MWCNT, the fabricated MWCNT-CPE was used for the simultaneous determination of SY and EY by simultaneously changing the concentrations of SY and EY. The oxidation peak current increased approximately linearly with increasing concentration of both SY and EY, showing that the simultaneous determination of SY and EY is possible at this electrode with two well-distinguished anodic peaks at potentials of 0.70 and 0.85 V, corresponding to the oxidation of SY and EY respectively. The detection limits was 3.0×10^{-9} and 8.0×10^{-9} mol l^{-1} for SY and EY, respectively, which are remarkably lower than those reported previously for SY and EY using other modified electrodes. Finally, this electrode used for simultaneous determination of SY and EY in soft drinks with satisfactory results.

Keywords: Simultaneous determination, Food dyes, Modified electrode, Soft drinks.

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PS341

Modeling of an electrochemical aptasensor based on Den-QD bioconjugate as an immobilization platform for ultra-sensitive detection of ibuprofen

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ABSTRACT

A novel aptasensor for the ultra-sensitive detection of Ibuprofen (IBP) as a painkiller drug [1] was developed based on a covalent immobilization of Den-QD bioconjugate on the surface of an electrode. Based on this protocol, TGA capped CdTe QDs is immobilized on the surface of the GC electrode, and the Den is covalently attached to the carboxyl group on the CdTe QDs via amide coupling [2]. In this way, by using terephthalaldehyde as a linker agent, amino capture probe (ssDNA1) is covalently attached to the amine group on the Den, all of which occur on the electrode surface, and subsequently the IBP specific Apt (ssDNA2) is hybridized with the capture probe. By IBP incubation and upon the formation of the Apt/IBP complex on the modified electrode surface [3], the eT characteristics of redox probe will change; this can be monitored by the DPV technique. The assay had a dynamic range from 1 pM to 12 nM with a LOD down to 333 fM. Some other interfering drugs was successfully investigated for evaluation of specificity of the designed aptasensor. The developed aptasensor reliably detects IBP in a real sample. Our results demonstrated that the proposed strategy have many advantages and the Den-QD bioconjugate may become a promising nanocomposite for the electrochemical sensing applications.

Keywords Aptasensor, Quantum dot, Dendrimer, Aptamer, Bioconjugate, Ibuprofen.

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PS342

Simultaneous voltammetric determination of codeine and paracetamol using a poly(diphenylamine) reduced graphene oxide modified glassy carbon electrode

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ABSTRACT

Paracetamol is a valuable and effective analgesic agent that is widely used for the for the relief of moderate pain, headache and fever. Codeine phosphate is an opioid derived from morphine, which is used as an efficient analgesic in pharmaceutical preparations. Combination of paracetamol and codeine offers effective analgesia at reduced doses of individual agents, and used to relieve moderate to severe pain[1]. A number of analytical methods such liquid chromatography and capillary electrophoresis have been used to quantify paracetamol and codeine in pharmaceutical formulations and biological fluids[2,3]. Although chromatographic methods provide reliable results, but they are generally laborious and time-consuming. To overcome these defects, electrochemical methods are widely used because of their properties, such as selectivity, simplicity, and reproducibility.

In this study, a sensitive electrochemical method based on poly(diphenylamine)–reduced graphene oxide (PDA/rGO) was developed for simultaneous determination of codeine and paracetamol in pharmaceuticals samples. In acetate buffer, the PDA/rGO electrode showed an excellent electrocatalytic activity toward the oxidation of codeine and paracetamol. The surface morphology of modified electrode was studied using field-emission scanning electron microscopy (FE-SEM). Under optimum conditions ,the linear ranges for the determination of codeine and paracetamol using differential pulse voltammetry were 5–750 and 1–1100 µM, respectively.

Keywords: Graphene oxide, Poly(diphenylamine), Paracetamol, Codeine

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PS343

Application of liquid phase microextraction for preconcentration and simultaneous electrochemical determination of acetaminophen and aspirin in biological samples

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ABSTRACT

Combination drugs consisting of Acetaminophen (ACOP), Aspirin (ASA) are used to treat pain from conditions such as headache (including migraine), muscle aches, menstrual cramps, arthritis, backache, toothaches, colds and sinus infections. However, an overdose of these combination drugs may induce nausea, vomiting, diarrhea, abdominal pain, sweating, seizures, confusion or an irregular heartbeat. Hence, their determination in trace quantities is of great importance. Previously, electrochemical techniques have been implemented for the estimation of ACOP [1], ASA [2] when present individually.Determination of drugs in real sample needs to a sample preparation. In this work, liquid of microextraction followed by differential pulse voltammetry has been develop for simultaneous determination of ACOP and ASA in biological samples. The effect of experimental parameters for been investigated and optimized. The effect of interference was evaluated. The method was successfully applied for determination of ACOP and ASA in human serum and water samples. Therefore, it is desirable to develop simple, sensitive and precise methods employing screen-printed electrodes for the simultaneous determination of two molecules.

Keywords: Acetaminophen, Aspirin, Microextraction, Differential pulse voltammetry

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PS344

Sensitive electrochemical label free DNA biosensor for determination of levodopa with Fe_3O_4 nanoparticle decorated reduced graphene oxide modified electrode

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ABSTRACT

An electrochemical biosensor was developed for Levodopa (LD) detection using label-free double strand DNA (ds-DNA) and graphene oxide (Gr) decorated with Fe_3O_4 magnetic nanoparticles on a carbon paste electrode (CPE). Scanning electron microscope (SEM), Energy dispersive x-ray (EDX) and Fourier transform infrared (FT-IR) spectroscopy were confirmed structure of the synthesized nanocomposites. Electrochemical studies revealed that modification of the electrode surface with ds-DNA and Gr- Fe_3O_4 nanocomposite significantly increases the oxidation peak currents and reduces the peak potentials of Levodopa. After the optimization of operational parameters, calibration curve was linear in the range of 5×10^{-8}-900×10^{-6} mol L^{-1} with a detection limit of 1.7×10^{-8} mol L^{-1}. The relative standard deviations for 20 µM was 4.06% (n=5). The proposed biosensor was successfully applied to the analysis of levodopa in human serum.

Keywords: DNA biosensor, Carbon paste electrode, Levodopa, Nanocomposite.

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PS345

Electrochemical determination of methotrexate using $CoFe_2O_4$- reduced graphene oxide nanocomposite using differential pulse voltammetry

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ABSTRACT

In this work, $CoFe_2O_4$/G was synthesized and characterized through spectroscopic and electrochemical methods, and used for modification of GCE to determination the methotrexate as anticancer drug. Cyclic and differential pulse voltammetry were used as electrochemical techniques to study the electrochemical behavior of methotrexate at the modified electrode. The results of our study showed that the modified electrode has a synergetic effect on the oxidation of methotrexate. After optimization of the experimental and instrumental conditions, methotrexate was measured in the range of 0.10 to 7.5 µmol L^{-1} with a limit of detection of 0.02 µmol L^{-1}. Relative standard deviation for five replicates measurements of 2.0 µmol L^{-1} methotrexate was 4.5%. The selectivity and applicability of the proposed electrochemical sensor toward methotrexate were investigated using analysis of pharmaceutical tablets with satisfactory results.

Keywords: Methotrexate, Graphene oxide, Cobalt ferrite nanocomposite, Differential pulse voltammetry.

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PS346

A sensitive electrochemical DNA biosensor based on reduced graphene oxide and Fe_3O_4 nanoparticles for determination of menadione

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ABSTRACT

Here, we developed a sensitive electrochemical lable free double strand DNA biosensor (ds-DNA) to determination of menadione (MD). The biosensor was constructed using a modified nanocomposite consisting of reduce graphene oxide (Gr) and Fe_3O_4nanoparticles on a carbon paste electrode (CPE). These Gr-Fe_3O_4 nanocomposites formed a sensetive compound with strong advantages such as large surface area, where as Fe_3O_4 was uniformly decorate on the reduce graphene oxide, facilitating electron transfer for sensitive determination, fast responses and a low detection limit. Immobilization of the ds-DNA on the electrode was greatly improved owing to the unique synergistic effects Gr-Fe_3O_4 nanocomposite. After the optimization of operational parameters, calibration curve was linear in the range of 3×10^{-8} - 400×10^{-6} mol L^{-1} with a detection limit of 0.019×10^{-8} mol L^{-1}. The relative standard deviations for 200µM was 4.20 % (n=5). The proposed biosensor was successfully applied to the analysis of menadione in human serum.

Keywords: DNA Biosensor, Carbon paste electrode, Menadione, Nanocomposite.

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PS347

Modification of glassy carbon electrode with cobalt oxide nanoparticles /nafion composite for the determination of phosphate ion in by square wave voltammetry method

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ABSTRACT

The design and characterization of new materials for fabrication of solid state ion-selective electrodes have been the subject of a number of recent investigations. Since the first attempt to prepare a phosphate ion-selective electrode about 52 years ago, the design of a practically useful phosphate ion sensor remained an unsolved problem in sensor studies.

In this study, for the first time, a novel, simple and high selective ion electrochemical sensor for the direct determination of phosphate ion was presented by using square wave voltammetry method. The sensor was fabricated via the drop-casting of cobalt oxide nanoparticles (Co_3O_4NPs)/nafion suspension onto a glassy carbon electrode (GCE) for the selective determination of phosphate ion.

Cobalt oxide nanoparticles were successfully synthesized by mechanochemical reaction, which is a green, low cost, solvent free, rapid method. An optimum electrochemical response was obtained for the sensor in the 0.1M KCl solution at pH 8.0 and using 50 µL NPs suspension cast on the surface of GCE. An anodic peak was observed at about 0.9V. The calibration curve was linear in the range of 0.03-2 M. The limit of detection was found to be 0.02 M and the relative standard deviations was 1.3%. The Co_3O_4NPs modified GCE was successfully applied for the determination phosphate ion in different real samples. This electrode was able to be used as a sensor to determine phosphate ion in a plant with continuous flow of phosphoric acid.

Keywords: Cobalt oxide nanoparticles, Phosphate ion, Glassy carbon electrode, Ion-selective solid state electrode

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PS348

Synthesis of hematite nanoparticles and their applications in investigation of dexamethasone electrochemical behavior

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ABSTRACT

Among the various metal oxide nanostructures, the hematite (α-Fe_2O_3) is one of the promising material due to its special properties such as most stability under the ambient conditions, non-toxic, and etc. The excellent properties of α-Fe_2O_3 make this a promising material for various applications, such as sensors, photocatalysis, pigments, and so forth. In this present work, α-Fe_2O_3 nanoparticles were synthesized by simple hydrothermal process at the temperature of 180 °C and were characterized in terms of their morphological, structural and compositional properties by SEM and XRD. The electrochemical behaviorof dexamethasone (DXA) was studied at the surface of α-Fe_2O_3 nanoparticles modified glassy carbon electrode in an aqueous buffer solution (pH=6.0). The redox properties of this modified electrode was investigated by the cyclic voltammetry, differential pulse voltammetry and chronoamperometry techniques. The transfer coefficient, α and diffusion coefficient, D of DXA, are 0.64 and 3.5×10^{-5} cm^2s^{-1} respectively. The oxidation peak currents of DXA in modified electrode increased linearly with the concentrations of DEX in the range between 5.0-100.0 μM with a detection limit of 20.0 nM. So the α-Fe_2O_3 modified glassy carbon electrode successfully used to determine DXA in real samples [1,2].

Keywords: α-Fe_2O_3 nanoparticles, Electrocatalyst, Dexamethasone, Modified electrode

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PS349

Nicotine microextraction from aqueous solutions prior to voltammetric determination using a magnetic ionic liquid

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ABSTRACT

To date, different analytical methods including chromatography, spectrophotometry and electrochemical have been adapted for the determination of nicotine in samples of various origin. Electroanalytically techniques are simple, cheap and reliable compared with other methods [1]. In this work a simple, sensitive, and inexpensive singe-drop microextraction (SDME) followed by an electrochemical detection was developed for the determination of nicotine in aqueous samples. The target compound was extracted from a phosphate buffer solution into a magnetic ionic liquid (MIL) drop [2]. Rapid isolation of the extraction phase was achieved by applying an external magnetic field [3]. Then, the MIL drop was casted on the surface of a carbon paste electrode. Under optimized experimental conditions, calibration plots were found to be linear in the range of 1.0-100.0 µM. The detection limit value of the approach was 0.080 µM. The repeatability of the proposed method, expressed as relative standard deviation for 5 replicate measurements at 5.0 µM, was calculated to be 7.1%. The proposed procedure was successfully applied to the determination of the analyte in tobacco and urine samples with satisfactory results.

Keywords*:* Singe-drop microextraction, Electrochemistry, Nicotine, Magnetic ionic liquid

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PS350

A novel biosensor based on Pd decorated reduced graphene oxide poly (2-anilinoethanol) nanocomposite and its application for the determination of dopamine

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ABSTRACT

Pd docorated reduced graphene oxide poly (2-anilinoethanol) nanocomposite (RGO-P2AE-Pd) was fabricated and used as a biosensor for detecting dopamine (DA). Graphene oxide was synthesized through a modified Hummer's method and then reduced [1]. It was then exposed to 2-anilinoethanol monomers to form the nanocomposite which was subsequently decorated with Pd nanoparticles. The scanning electron microscopy images showed that Pd nanoparticles with an average size of 25 nm are placed on the nanocomposite. The synthesized nanocomposite was used to modify glassy carbon electrodes (GCE). The electrocatalytic activity of RGO-P2AE-Pd towards DA was investigated using cyclic voltammetry and differential pulse voltammetry. The developed sensor exhibited a linear range up to 0.25 mM of DA, which is more than most of the existing non-enzymatic DA sensors based on nanocomposites. The detection limit is 2.4×10^{-8} M (at signal/noise=3). Moreover, the biosensor showed excellent selectivity, reproducibility and stability properties. These excellent performances make RGO-P2AE-Pd a good non-enzymatic DA sensor in clinical and pharmaceutical samples in the presence of interfering agents such as ascorbic acid (AA) and uric acid (UA). Pd docorated reduced graphene oxide poly (2-anilinoethanol) nanocomposite (RGO-P2AE-Pd) was fabricated and used as a non-enzymatic biosensor for detecting dopamine (DA). Graphene oxide was synthesized through a modified Hummer's method and then reduced. It was then exposed to 2-anilinoethanol monomers to form the nanocomposite which was subsequently decorated with Pd nanoparticles. The scanning electron microscopy images showed that Pd nanoparticles with an average size of 25 nm are placed on the nanocomposite. The synthesized nanocomposite was used to modify glassy carbon electrodes The electrocatalytic activity of RGO-P2AE-Pd towards DA was investigated using cyclic voltammetry and differential pulse voltammetry. The developed sensor exhibited a linear range up to 0.25 mM of DA, which is more than most of the existing non-enzymatic DA sensors based on nanocomposites. The detection limit is 2.4×10^{-8} M (at signal/noise=3). Moreover, the biosensor showed excellent selectivity, reproducibility and stability properties. These excellent performances make RGO-P2AE-Pd a good non-enzymatic DA sensor in clinical and pharmaceutical samples in the presence of interfering agents such as ascorbic acid (AA) and uric acid (UA).

Keywords: Dopamine; Non-enzymatic biosensor; Modified glassy carbon electrode; Nanocomposite Poly(2-anilinoethanol)

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PS351

Voltammetric determination of metronidazole using modified carbon paste electrode with SnO_2 nanoparticles

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ABSTRACT

The performance of carbon paste electrode with SnO_2 nanoparticles (nano-SnO_2/CPE) for the detection of metronidazole (MTZ), as the most important drug of the group of 5-nitroimidazole [1,2], is studied using cyclic voltammetry (CV) and square wave voltammetry (SWV) technique. Raw and modified CPE and SnO_2 were characterized by XRD and SEM-EDX techniques. Simultaneous interactions of the most important key operating factors on the voltammetric response of the modified electrode were studied by designing the experiments based on the response surface methodology (RSM). The interaction between three variables, pH, potential scan rate and modifier percentage was studied and modeled. The result of optimization showed that the higher voltammetric peak current was registered at pH 5, scan rate 160 mV s and 36.8% of the SnO_2 modifier. Under optimal conditions, a linear analytical curve was obtained for the MTZ concentration in the range of 1×10^{-8} to 1×10^{-5} mol L^{-1} whit a detection limit of 7×10^{-9} mol L^{-1}.

Keywords: NanoSnO_2/CPE, Metronidazole, Experimental design

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PS352

A simple and efficient nano-structured gold film sensor to determine quercetine electrochemically

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ABSTRACT

A straight, rapid and “green” method was offered for the fabrication of gold nonporous film. A gold electrode was oxidized under a potential of 5 V, and ascorbic acid, as a safe reducing agent, was used for reducing gold oxide. This procedure gives a pack gold nonporous film on the surface of the gold electrode in a way of completely “green” chemistry. The nanostructure modified electrode is a strong sensore for electrochemical oxidation of Quercetine (Qu). when the gold nano-structure electrod was formed any relocation no need and a sentimental sensor for the detection of Qu has been produced. In the present study, the oxidation peak current of the Qu in a 0.10 M phosphate buffer solution was optimized for its determination by the differential pulse voltammetry method. The variables which optimized include scan rate, step potential, and pH. Then, under the optimized conditions the dynamic range for Qu 0.02 µM to 20 µM and the detection limit was found to be 2 nM. Cyclic voltammetry and other electrochemical methods such as chronocoulometry, was used to investigate the electrochemical behavior of Qu on the gold nano-structured modified electrode. Using these methods, the diffusion coefficient ($D = 2.6\times10$^2 cm^2 s^{-1}) and the kinetic parameters such as the electron transfer coefficient (α = 0.67) and exchanging current density ($j0$ = 0.028 µA cm^{-2}) for GA were determined. The number of proton and electron transfer for the oxidation of Qu were investigated to be two protons and two electrons.

Keywords: Gold nano-structured film, Quercetine (Qu), Electrocatalysis, Cyclic voltammetry

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PS353

New carbon paste selective electrode for sensitive and selective determination of methyldopa in pharmaceutical and biological samples

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ABSTRACT

Methyldopa (MDOP), as (2-amino-3-(3,4-dihydroxy-phenyl)-2-methyl-propanoic acid, is one of the most important drugs used for treatment of high blood pressure. It's a catecholamine derivative which is used as an old antihypertensive agent in the treatment of mild to moderate hypertension. It is converted to α-methyl norepinephrine in adrenergic nerve terminals, and its antihypertensive action appears to be due to stimulation of central α-adrenoreceptors by this agent [1]. Different analytical methods have been developed for the determination of methyldopa and its metabolites including spectrophotometry [2], voltammetry [3] and chromatography [4]. However, no potentiometric sensor for this drug has been reported so far.

In this study, performance characteristics of a new potentiometric carbon paste sensor for the fast, easy and selective determination of methyldopa was described. The constructed potentiometric sensor is based on the use of the 2-hydroxypropyl-β-cyclodextrin [5] as a good ionophore in the carbon paste matrix. The proposed electrode exhibits a Nernstian slope of 59.1 mV/decade for methyldopa over a concentration range of 1.5×10^{-7}– 2.4×10^{-3} M, with a detection limit of 8.7×10^{-8} M. The electrode has a fast response time (6 s), satisfactory reproducibility, long life time (more than 2 months) and, most importantly, excellent selectivities for methyldopa relative to a variety of foreign species. Potentiometric response of the electrode in the buffer solution was studied. The influence of the temperature on the response of electrode was also investigated and the temperature coefficient of the electrode was calculated by recording the calibration graphs at different temprature s. The electrode was applied for determination of this drug in real samples such as methyldopa tablet and human blood serum samples.

Keywords: Potentiometric, Sensor, Methyldopa, Carbon paste electrode

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PS354

Voltammetric determination of piroxicam using a MWCNT–ZnO nanoparticles modified carbon paste electrode

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ABSTRACT

In this essay, we have been applied a novel voltammetric sensor for electrochemical determination of piroxicam (PC) based on its oxidation was studied at a MWCNT–ZnO nanoparticles modified carbon paste (MWCNT–ZnO–CP) electrode. The electrochemical mechanism of PC oxidation was studid by cyclic voltammetry (CV) and its determination were carried out by square wave voltammetry (SWV) in 0.1 mol L^{-1} phosphate buffer solution (pH=7.0) as suitable supporting electrolyte.

The cyclic voltammogram showed an irreversible anodic peak at 0.8 V (vs. calumel saturated references electrode), which corresponded to the oxidation of PC. Under the optimized conditions, the oxidation peak current of PC showed linear dynamic range 0.07–50 µM with a detection limit of 0.02 µM, after 120 s of accumulation time, using the SWV method. With this method, we determine the PC in drug formulation and human serum sample, without any interference from the excipients (RSD<4.5 %). Comparison of these results with that obtained by HPLC method shows a good agreement between two methods.

Keywords: Carbon paste electrode; Piroxicam (PC); Square wave voltammetry (SWV); *MWCNT-ZnO*

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PS355

Modified glassy carbon electrode with galvanized copper nanowires by palladium and carbon nanotubes for speciation of dihydroxybenzene isomers

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ABSTRACT

The dihydroxybenzene isomers, hydroquinone (HQ), catechol (CC) and resorcinol (RS) have been widely recognized as important environmental pollutants due to their high toxicity and low degradability in the ecological environment. Speciation of HQ, CC and RS is very important for environmental analysis because they co-exist of these isomers in environmental samples and are too difficult to degrade as environmental contaminant with high toxicity [1, 2]. There are many analytical methods have been reported for detect these isomers, such as spectrophotometry [3], fluorescence [4], high performance liquid chromatography (HPLC) [5] and electrochemical methods [6–7]. These methods have attractive advantages such as simple and fast response, low maintenance costs, wide linear analysis range, high efficiency, excellent selectivity and high sensitivity. A novel modified glassy carbon electrode (GCE) with galvanized copper nanowires by palladium (CuNWs-Pd) and carbon nonotubes (CNTs) for the simultaneous determination of hydroquinone (HQ), catechol (CC) and resorcinol (RS) is described. A detailed investigation by field emission scanning electron microscopy and electrochemistry was performed in order to elucidate the preparation process and properties of the GCE/ Pd/CuNWs-CNTs. The electrochemical response characteristics of the modified GPE/LFOR toward HQ, CC and RS were investigated by cyclic voltammetry, differential pulse voltammetry (DPV) and Chronoamperometry. Under optimum conditions, the calibration curves were liner up to 228 μM for each with detection limits of 0.4, 0.6 and 0.8 μM for HQ, CC and RS, respectively. The diffusion coefficient for the oxidation of HQ, CC and RS at the modified electrode was calculated as 6.5×10^{-5}, 1.6×10^{-5} and 8.5×10^{-6} cm^2 s^{-1}, respectively. DPV was used for the simultaneous determination of HQ, CC and RS at the modified electrode and the relative standard deviations were 2.1%, 1.9% and 1.7% for HQ, CC and RS, respectively. Moreover, GCE/Pd/CuNWs-CNTs was successfully used for determination of HQ, CC and RS in real samples.

Keywords: Galvanized copper nanowires, Palladium, Electrochemical sensor, Speciation, Dihydroxybenzene isomers.

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PS356

Fabrication of a novel nanoaptasensor for ultrasensitive detection of TNT based on a facile one-step electrodeposition of AgNPs as an efficient platform

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ABSTRACT

Due to increasing concerns on environmental protection and global security, 2,4,6-Trinitrotoluen (TNT) as an explosive material has drawn the attention of many scientists [1]. In this study, the proposed one-step electrodeposition of AgNPs as an efficient platform for designing of a method for sensing of the TNT represents a new progress in the family of electrochemical nanoaptasensors. Using electrodeposited AgNPs nanolayer as a substrate to immobilize aptamer (Apt) as a capture molecule of TNT, a great signal amplification was achieved through measuring changes in DPV peak current of riboflavin (RF) redox system. In this study, RF [2] has been used for the first time as the green redox probe in the development of the electrochemical nanoaptasensor for the diagnosis of TNT. According to this strategy, the addition of TNT to the nanoaptasensor surface leads to decrease in peak current of the RF probe. Therefore, the signal is changed by an underlying redox probe in such a way that any little change in the surface that is induced by specific binding of Apt with TNT can significantly alter the interfacial properties, influencing the facility with which the eT reaction performs. As a result, the LOD of this electrochemical nanoaptasensor was pushed down as low as 33.33 aM and the dynamic range was considerably broad (from 0.1 fM to 10 μM) without sacrificing its specificity. Furthermore, the designed nanoaptasensor exhibited a higher selectivity for TNT against other common interferences such as 1,3,5-Trinitroperhydro-1,3,5-triazine, p-toluidine, 2,4-dinitrotoluene, 4-Nitroaniline, 1-Bromo-4-nitrobenzene. Also this method was used for TNT detection in soil and water samples as real samples with satisfactory results. Moreover, the proposed strategy, which does not require any label, enzyme, redox indicator, any tedious procedure or complicated strategy, is very simple and time saving in comparison to other nanomaterial-based signal amplification strategies. It is hoped that the present study opens a new window of using such nanolayer as efficient platform in the promising field of sensing or biosensing application.

Keywords: TNT, Aptasensor, AgNPs, Electrodeposition, Aptasensig assay.

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PS357

A novel sensor for sensitive determination of warfarin based on cobalt oxide nanoparticles electrodeposited at multi-walled carbon nanotubes modified glassy carbon electrode (Co_xO_yNPs/MWCNTs/GCE)

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ABSTRACT

In this work, the cobalt oxide nanoparticles were electrodeposited on multi-walled carbon nanotubes glassy carbon electrode (MWCNTs/GCE) to develop a new sensor for warfarin determination. The modified electrodes were characterized with cyclic voltammetry, electrochemical impedance spectroscopy (EIS) and scanning electron microscopy (SEM). The presence of cobalt oxide nanoparticles on the electrode surface enhanced the warfarin accumulation and its result was improvement in electrochemical response of the sensor. The effect of various parameters such as pH, scan rate, accumulation potential, accumulation time and pulse amplitude on the sensor response was investigated. The adsorptive anodic stripping differential pulse voltammetric (DPV) response of modified electrode was linear in the ranges of 8 nM to 50 μM and 50 μM to 800 μM with correlation coefficients of greater than 0.998. The limit of detection of proposed method was 3 nM. The proposed method was applied to determine warfarin in urine and plasma samples.

Keywords: Warfarin; Adsorptive anodic stripping differential pulse voltammetry (AASDPV); $MWCNT_S$; Cobalt oxide nanoparticles.

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PS358

Study of electrochemical behavior of capsaicin using modified pencil graphite electrode and application of this electrode for real sample analysis

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ABSTRACT

Application of the modified electrodes in study of electrocatalytic behavior of compounds has been done by researchers for several years [1-3]. In this research, electrochemical oxidation of capsaicin was investigated by differential pulse voltammetry method by applying the potential range of 0.3-0.9 V and scan rate of 50 mV/s in KOH as supporting electrolyte on modified pencil graphite electrode. The pencil graphite electrode was activated by chronoamperometry method by applying the potential of -1 V for 240 s in alloy solution of Ag and Zn with certain ratio and optimized conditions of electro-oxidation of capsaicin was determined by studying the type and concentration of supporting electrolyte, activation method and percentage of alloy used for modification.The calibration curve obtained from differential pulse voltammetry method have a linear range for concentration of 0.05-0.45 mM and detection limit of 0.028 mM for modified pencil graphite electrode. Lastly, this electrode was used for detection of capsaicin in green and red pepper and percentage of relative standard diviation (RSD) obtained 2.53 and 5.3 for these real samples, respectively.

Keywords: Capsaicin, Pencil graphite electrode, Differential pulse voltammetry

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PS359

Electrochemical study of captopril on glassy carbon electrode modified by molecularly imprinted polymer

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ABSTRACT

The technology of molecular imprinting is a viable synthetic approach to developed polymers with high selectivity and affinity for the target materials able to mimic natural recognition entities[1]. The use of molecularly imprinted polymers (MIP) has received much attention, due to its inherent advantages, such as the low cost of synthesis, high mechanical and chemical stability, as well as a highly selective recognition. MIP as a nano-spherical material, has a better performance for selective removal of trace of analytes from complex samples because of its small particle size and high specific surface area which could lead to a large amount of adsorption capacity and a fast adsorption rate [2]. Captopril is a specific inhibitor of the angiotensin converting enzyme which is widely used in the treatment of hypertension [3].

In this work, we will present a novel approach for the detection of small molecules with molecularly imprinted polymer (MIP)-type receptors. We describe a new strategy for the electrochemical study of captopril (CA) using MIP-GCE (Glassy Carbon Electrode) as a sensor in aqueous solution at pH 3.0. The MIP was characterized by FT-IR, scanning electron microscopy (SEM). The kinetic parameters such as electron transfer coefficient (α), for CA were also determined using electrochemical approaches.

Keywords: Electrochemical study, Captopril, Glassy carbon electrode, Molecularly imprinted polymer

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PS360

Development of an aptasensor for tetracycline detection based on poly(L-glutamic acid) modified glassy carbon electrode

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ABSTRACT

Aptamers are artificial DNA or RNA ligands which can be used for basic research, and they have recently been used to measure macromolecular drugs including tetracycline for clinical purposes [1]. Tetracycline (TET) is a part of a drug family of antibiotics which bind to the ribosome and block protein building [2]. TET has been measured by various methods, including HPLC, colorimetry, capillary electrophoresis (CE), and electrochemical methods [3,4]. Among the electrochemical methods, designing aptasensors has advantages such as having high chemical stability for a wide temperature range, reversible denaturation and rapid synthesis.

In this work, the fabrication of an aptasensor was investigated based on poly(L-glutamic acid) on the surface of GCE (PGA/GCE). The electropolymerization was performed on the electrode surface by cyclic voltammetric scan between -0.5 to 2.0 V at a scan rate of 100 mV/s (vs Ag/AgCl electrode) and 12 cycles.The terminal carboxylic acid groups of PGA-modified GCE provides a suitable base for attaching the aptamer. For interaction of PGA/GCE with anti-TET, the anti-TET solution was dropped on the surface of the electrode. The final modified electrode (anti-TET/PGA/GCE) was characterized by SEM, EIS, and voltammetric methods. The effects of aptamer concentration, aptamer immobilization time, and TET reaction time were investigated. Under optimum conditions, the sensitivity of aptasensor was investigated by EIS and DPV. The linear range and the detection limit for TET with the anti-TET/PGA/GCE aptasensor were found to be 1.0×10^{-6}-1.0×10^{-14} M and 3.5×10^{-15}M respectively by EIS method. The proposed aptasensors were applied for determination of TET in some real samples such as drug. This technique is a label-free detection method, and it is not necessary to modify the interest biomolecules with markers such as enzymes or other redox labels.

Keywords: Tetracycline, Electropolymerization, Aptamer, Electrochemical impedance spectroscopy

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PS361

Nickel nitride nanoparticles as efficient electrocatalyst for effective electro-oxidation of ethanol in alkaline media

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ABSTRACT

In this work, nickel nitride (Ni_3N) nanoparticles with spherical structure are successfully synthesized by urea glass route. The morphology of the products was examined with scanning electron microscopy (SEM). The Ni_3N nanoparticles exhibit a very uniform distribution and homogeneous range in size with a spherical structure with average diameter of 45 nm. The XRD pattern of materials prepared at different temperatures indicate that at 370℃ Ni_3N nanoparticles are formed. Thermal decomposition of nickel nitride occurs at temperatures higher than 380℃. At 470℃ diffraction peaks of nickel nitride nanoparticles have been removed. The electrocatalytic properties of the synthesized Ni_3N for ethanol oxidation in alkaline media were investigated using cyclic voltammetry and chronoamperometry. The glassy carbon electrode (GCE, 3 mm diameter) was polished with Al_2O_3 power, rinsed twice by deionized water and then dried at room temperature. The catalyst powder (10.0 mg) was dispersed ultrasonically in 1.0 mL of 0.1 wt.% nafion solution, then a 2.5 µL of this solution dropped on the pre-treated GCE to fabricate modified GCE which is nominated as NiN/GC. A peak current of about 200 µA for ethanol oxidation in 550 mV (vs. SCE) was recorded during ethanol oxidation under the test condition of adding 1.0 M alcohol in 0.1 M NaOH solution. The stability of the catalyst was investigated using steady state chronoamperometry for 1500 s. The results show that the nickel nitride exhibits excellent electrocatalytic activity that is very promising catalyst for fuel cell application.

Keywords: Nickel nitride, Alcohols oxidation, Fuel cells

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PS362

Application of a novel ion-imprinted nanopolymer as a high selective electrochemical sensor for determination of cadmium (II) ions in water samples

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ABSTRACT

In this work, a magnetic ion-imprinted polymer (Fe_3O_4@SiO_2@IIP) was synthesized and used of as a novel and selective electrode for the differential pulse voltammetry determination of cadmium ions from various samples. This magnetic ion-imprinted polymer was synthesized by application of 4-vinilpyridine (4-VP) as a functional monomer, ethylene glycol dimethacrylate as a cross-linker, 2,2-azobisisobutyronitrile as an initiator, and cadmium ions as a template ion. After polymerization, the Cd(II) in the polymer nanoparticles were leached out with dilute hydrochloric acid to create cavities for hosting Cd(II). This nanopolymer was evaluated by Fourier transform infrared spectroscopy (FT-IR), X-ray diffraction (XRD), thermogravimetry analysis (TGA), scanning electron microscopy (SEM) and energy dispersive X-ray spectrometry (EDS). In this work, the performance of a carbon paste electrode (CPE) modified with the IIP-NPs for the electrochemical determination of the Cd(II) ions was evaluated. An explicit difference in the response was observed between the electrodes modified with IIP-NPs and electrodes modified with non-IIP-NPs. The modified electrode responds to Cd(II) was linear in the 2.0×10^{-1} to 10.0×10^{-7} M concentration range. The limit of detection (LOD) of the sensor was 0.5×10^{-7} M (at S/N =3). The sensor was successfully applied to the trace determination of Cd(II) in spiked environmental water samples.

Keywords: Ion-imprinted nanopolymer, Ion selective electrode, Cd(II)

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PS363

Simultaneous determination of tryptophan and glutathione using modified carbon paste electrode with nano zeolit

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ABSTRACT

The aim of this research is simultaneous determination of Tryptophan (TRP) and Glutathione (GSH) using modified carbon paste electrode with nano zeolite. These electrochemical determinations were studied with optimal electrode by using cyclic voltammetry technique (CV), differential pulse voltammetry (DPV) in phosphate buffer with pH=7. Unmodified carbon paste electrode behavior, modified carbon paste electrode with nano-zeolite and modified carbon paste electrode with iron(II) ions doped nano zeolite were studied by using cyclic voltammetry technique. Modified carbon paste electrode with iron (II) ions doped, show two separate pick for Tryptophan and Glutathione. Optimal electrode shows sensitivity and high selectivity for TRP and GSH for simultaneously determination. Optimal pH, by using of voltammetry technique was investigated in presence of these substances. The optimized pH was 0.7. In optimum condition, the behavior of electrochemical TRP and GSH types, in presence of different values of the substance and constant value of the second substance were studied using of DPV method, that shows inconstant current in linear dynamic range (LDR) 2.0×10^{-5} M-5.0×10^{-4} M , 2.0×10^{-5} M-4.0×10^{-4} M and limit of detection were 3.51×10^{-6} M, 2.47×10^{-6} M respectively.

Keywords: Modified carbon paste electrode, Tryptophan, Glutathione, Cyclic voltammetry, Differential pulse voltammetry

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PS364

Fabrication of novel biosensor based on human albumin serum loaded $NiFe_2O_4$ magnetic nanoparticles for highly sensitive determination of folic acid

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ABSTRACT

Folic acid is a form of the water-soluble vitamin B_9 [6]. Folic acid is presence in biological samples such as blood and urine and selective determination of this compound is very important. In this study, we synthesized human albumin serum loaded $NiFe_2O_4$ magnetic nanoparticles (HAS/$NiFe_2O_4$/MNPs) as a modifier for folic acid analysis. The $NiFe_2O_4$/MNPs was synthesized by co-precipitation method with diameter of 17 nm. Then $NiFe_2O_4$/MNPs loaded onto HAS nanocapsule and characterized with SEM and DLS methods. The bio-nanocomposite loaded at a surface of carbon paste electrode in the presence of ionic liquid as a binder. The modified electrode can be adsorbing folic acid in pre-concentration condition. The proposed sensor showed dynamic range 0.08-300 µM with limit of detection ~ 20 nM. The proposed sensor was also examined for the determination of folic acid in real samples with recovery between 97.5%-104.3%.

Keywords: Folic acid, $NiFe_2O_4$/MNPs, Human albumin serum

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PS365

Synthesis of polyaniline-graphene oxide nanocomposite and investigation of its super capacitor properties

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ABSTRACT

In this study, the nanocomposite of polyaniline - graphene oxide, synthesized with in-situ chemically oxidative method. first, graphene oxide synthesis by modified hummer method, then use the in-situ polymerization of aniline monomer was the formation of nanocomposites. To identify and characterize the nanocomposite, scanning electron microscopy (SEM) and Fourier transform spectroscopy (FTIR) were used. Investigating of supercapacitor properties was performed by nanocomposites cycle voltammetry (CV) and galvanostatic charge-discharge (GCD). Scope of this study is synthesizing the graphene oxide-polyaniline and using supercapacitor materials.

Keywords: Graphene, Polyaniline, Polymerization, Nanocomposite, Supercapacitor.

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PS366

Raloxifene analysis in pharmaceutical samples using a nanostructure modified based electrode

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ABSTRACT

Raloxifene is an oral selective estrogen receptor modulator that has estrogenic actions on bone and anti-estrogenic actions on the uterus and breast [1]. A modified Fe_3O_4 nanoparticle was synthesized by chemical precipitation method and characterized with TEM and XRD methods. In continuous, carbon paste electrode modified with Fe_3O_4 nanoparticle and ionic liquid was fabricated and used for analysis of raloxifene. The fabricated sensor was showed dynamic range between 0.05-550 µM with limit of detection 12 nM for analysis of raloxifene. The RSD% for 10 replicates determination of 10.0 µM and 15.0 µM of raloxifene were 1.5% and 2.0%, respectively. The proposed sensor was also examined for the determination of raloxifene in real samples.

Keywords: Raloxifene, modified Fe_3O_4 nanoparticle, Carbon paste electrode

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PS367

Electrochemical oxidation of acetaminophen in the presence of thiols

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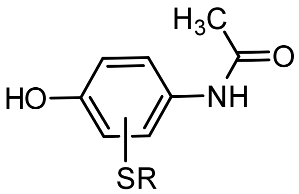
ABSTRACT

Electrochemistry provides very effective means for the electrosynthesis ,mechanistic ,kinetic and thermodynamic studies of electron transfer reactions and it is widely used for the synthesis of some new organic compounds due to their simple ,accessible, and practical properties, in addition being consistent with the principles of green chemistry.it is known that cyclic voltammetry is an available technique for consideration of electrochemical reactions that are coupled with chemical reactions. As an electroactive substance, acetaminophen has also attracted much interest. Acetaminophen is used worldwide for its analgesic and antipyretic properties [1]. It is widely available and present in many prescription and non-prescription medications [2].

Thiols, as one of the intercellular reducing agents, generally protect biological systems against oxidative and inflammatory stress by serving as radical scavengers and/or cofactors for intracellular enzymatic anti-oxidation functions [3]. In this work, the electrochemical behavior of acetaminophen hase been studied at various pH values in the presence of thiols,as nucleophiles in aqueous solutions using cyclic voltammetry and controlled-potential coulometry methods. The results indicate that the *N*-acetyl-p-benzoquinoneimine derived from oxidation of acetaminophen participates in Michael type addition reaction with thiols via the *EC* mechanism to form the corresponding new thiols derivatives.



Keywords: Electrochemical oxidation, Cyclic voltammetry, Acetaminophen, Thiols

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در دنیای پرشتاب و تحول‌گرای امروز، پیشرفت علم و فن‌آوری و دستیابی به تکنولوژی‌های نو یکی از پایه‌ای‌ترین و اصلی‌ترین نیازهای هر کشوری می‌باشد. کشور عزیزمان ایران نیز همواره در عرصه پیشرفت علوم و تکنولوژی نوین پیشتاز بوده و می‌باشد. در راستای این تحولات و نیاز روز افزون محققین و اساتید محترم دانشگاهها و مراکز تحقیقاتی و تلاشگران عرصه صنعت به تجهیزات روز دنیا و دستگاههای پیشرفته شرکت شایگان سرمد افتخار دارد با پشتوانه سالها تجربه مدیران و متخصصین آن در جهت مشاوره و تامین کلیه دستگاه ها و تجهیزات آزمایشگاهی و تحقیقاتی مورد نیاز عرصه صنعت و تحقیق کشور گام بردارد. شرکت شایگان سرمد با دارا بودن کادر علمی و فنی مجرب، توانایی انجام خدمات پس از فروش ، تامین قطعات و تعمیر دستگاه‌های ارائه شده را دارا می باشد .

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